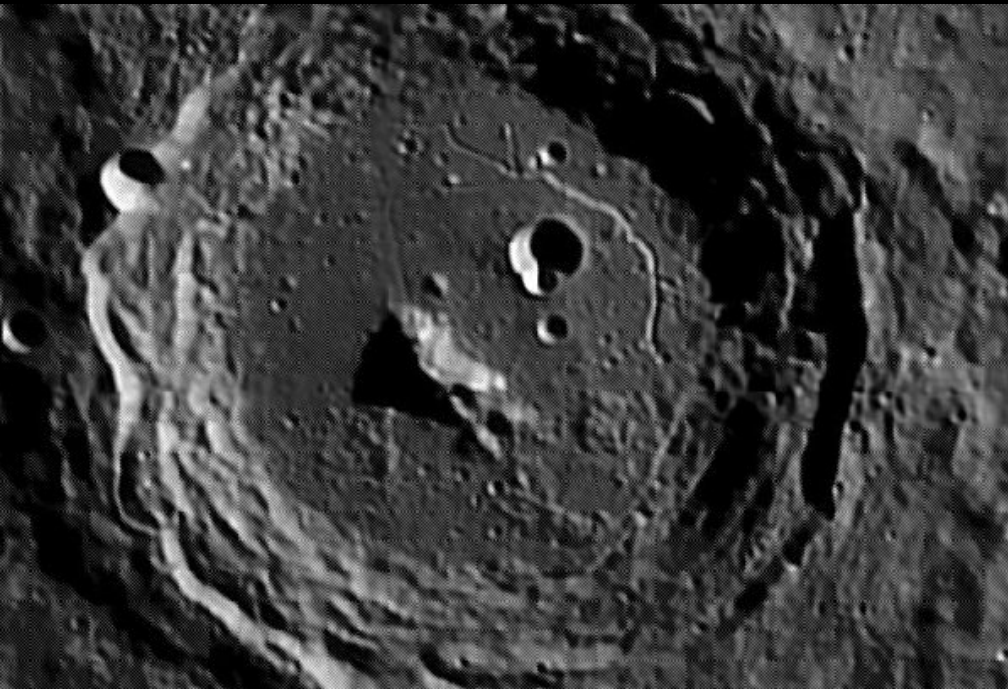
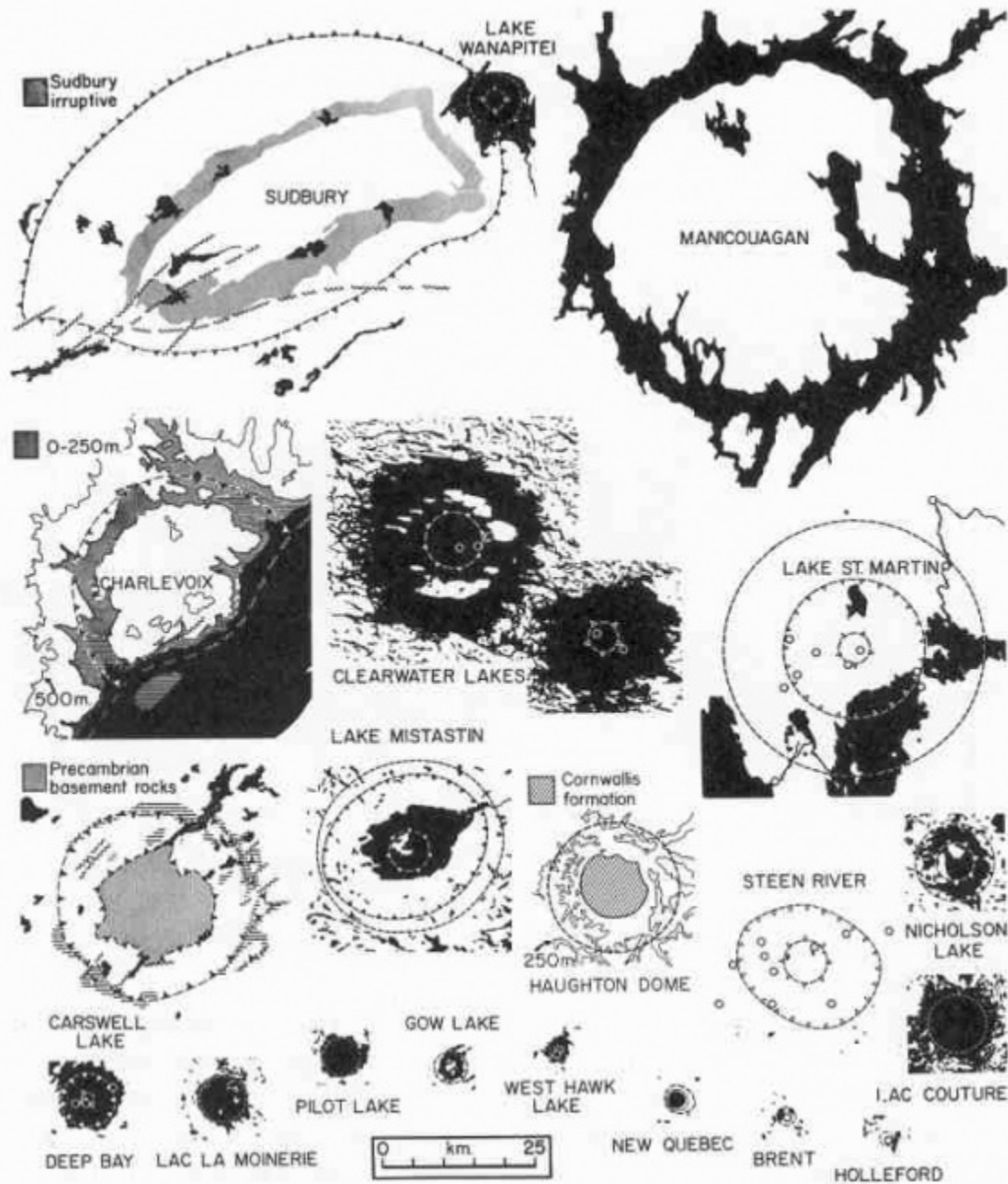


CRATER EXPLORATION

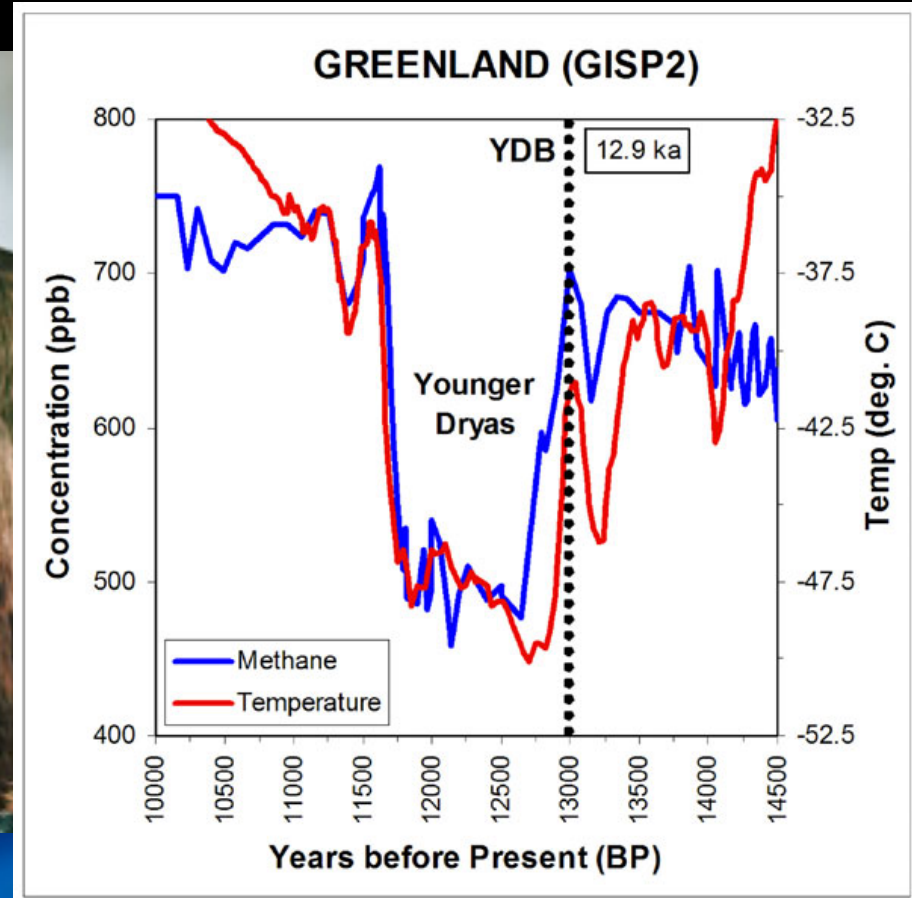




Which of these geologic features are impact craters?
What is definite proof of an impact site????



12.5Ka – Younger Dryas (YD) “Event”



NOVA

Greenland Ice Sheet Project 2
- understanding environmental change

Younger Dryas impact hypothesis

THE PLEISTOCENE EPOCH

extinct

Giant, then gone Mammoths and other creatures – 35 kinds of large animals – become extinct. One group of scientists believes that what killed them could be the same thing that created Carolina bays.

Clovis culture Ancestors of Indians, who used sophisticated hunting methods, also largely disappear.



GIANT BEAVER



GIANT SLOTH



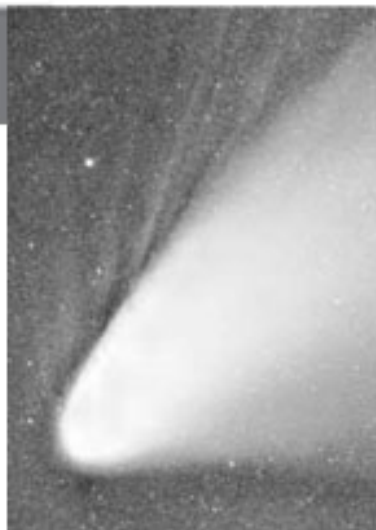
MAMMOTH

JOHN EARLE | THE VIRGINIAN-PILOT



CLOVIS MAN

**12,900
YEARS AGO**



comets

Thousands of years ago, a fragmented comet could have exploded on the Laurentide ice sheet or over it, authors of a scientific paper write.

In 1997, Comet Hale-Bopp comes within 122 million miles of Earth.

A 12,000 YEAR OLD MYSTERY

SOIL TELLS THE STORY

the black mat

In North America and Europe

The start of the Younger Dryas cold spell is marked in the soil by a layer called a black mat. Fourteen kinds of minerals, gases and other extraterrestrial materials have been found in the black mat, and in all of the Carolina bays tested, more than a dozen so far.



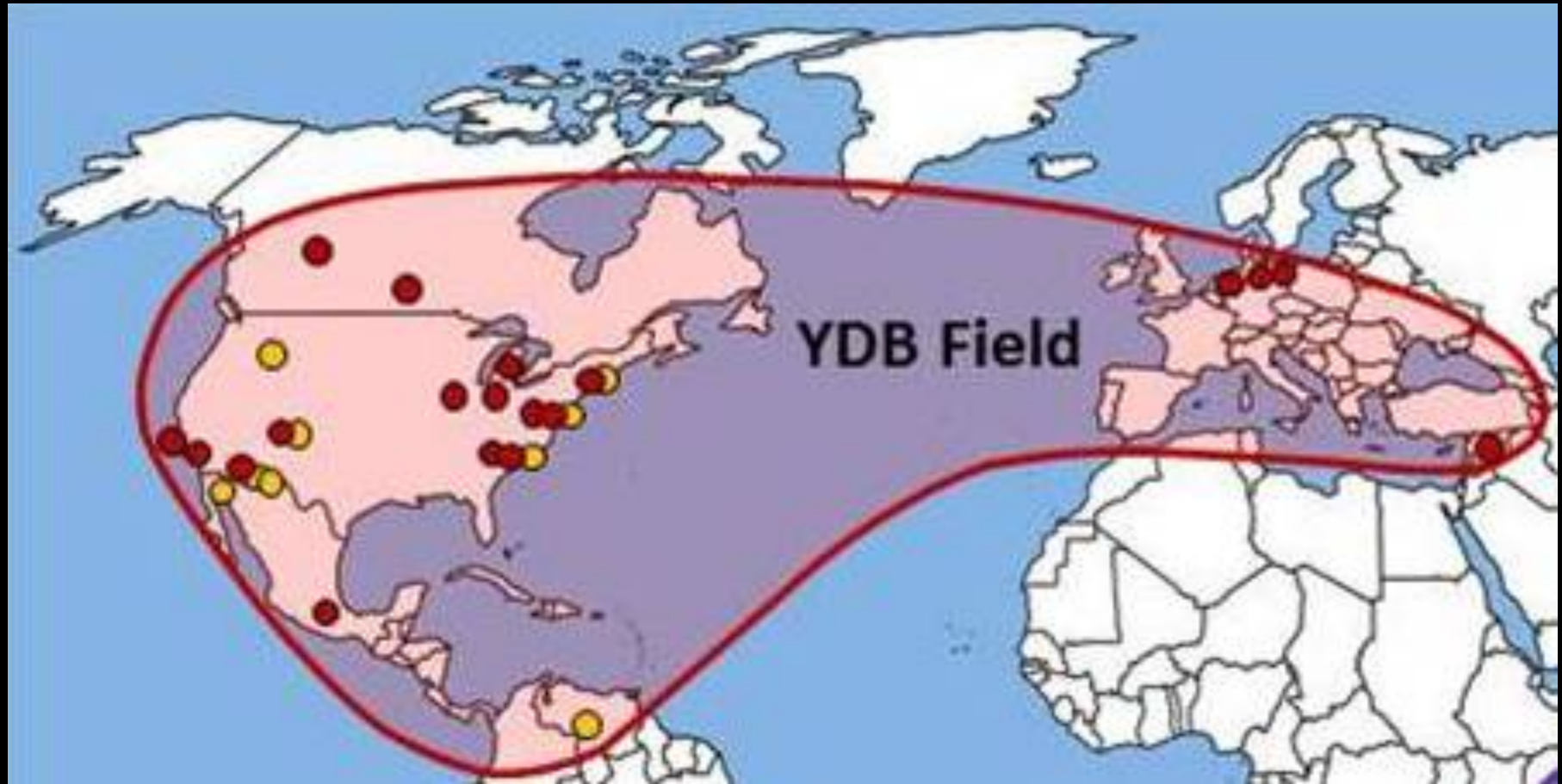
GEOLOGICAL SOCIETY OF AMERICA

Above A layer of sediment above the black mat holds no human artifacts, indicating a lack of occupation for many years after the mat was deposited.

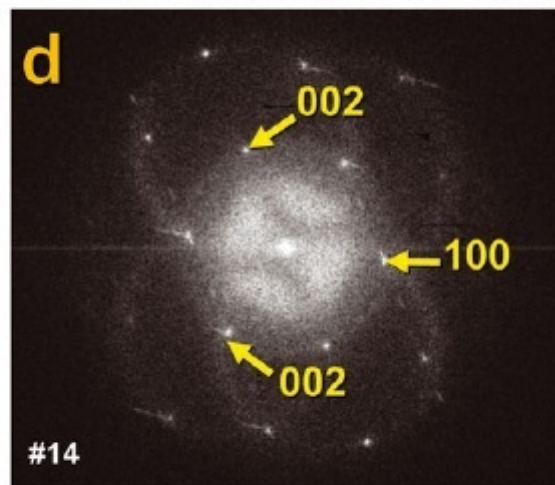
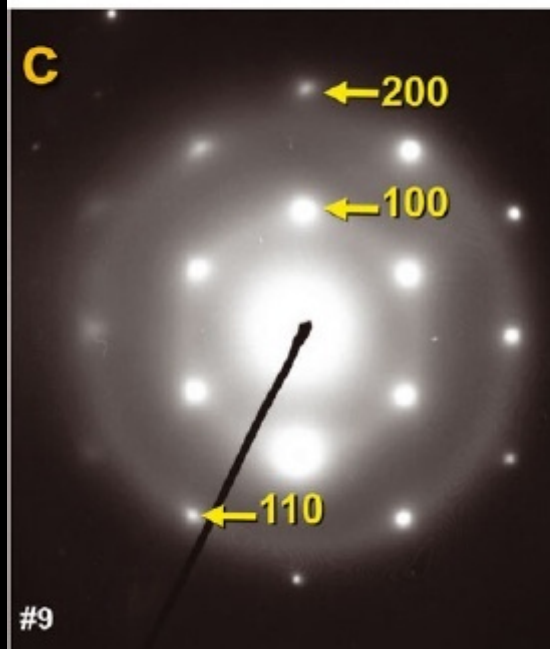
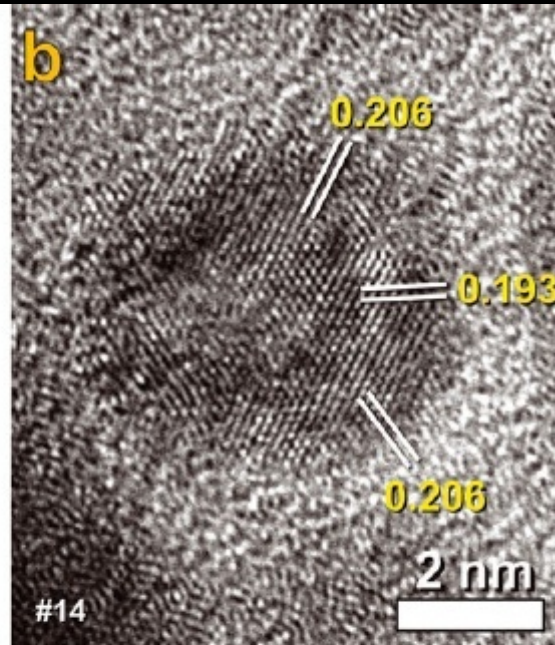
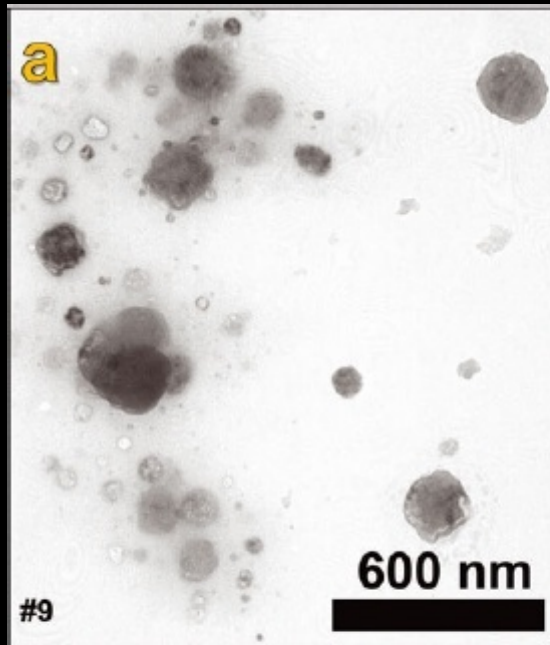
Below Artifacts of the Clovis people and bones from giant animals of the Pleistocene Epoch are found directly below the black mat, not above it.



Black Mat at Younger Dryas “event”



Hexagonal ~ 1/3 of ND found in Black Mat

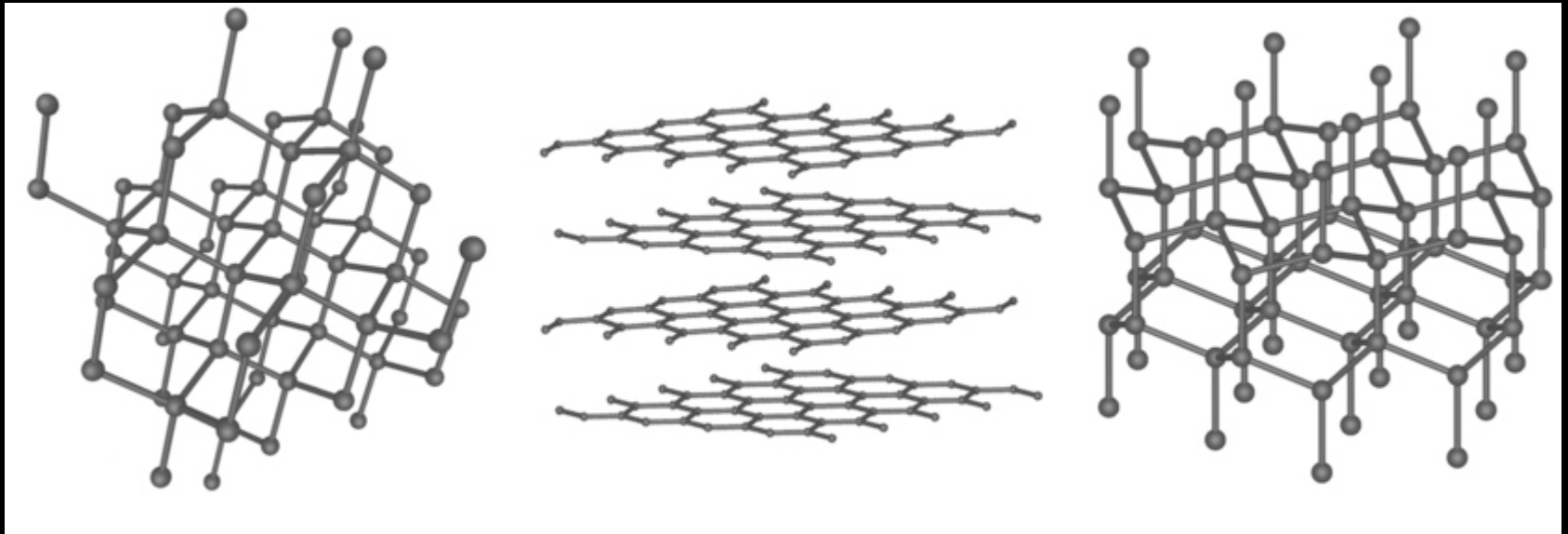


Lonsdaleite (hexagonal)

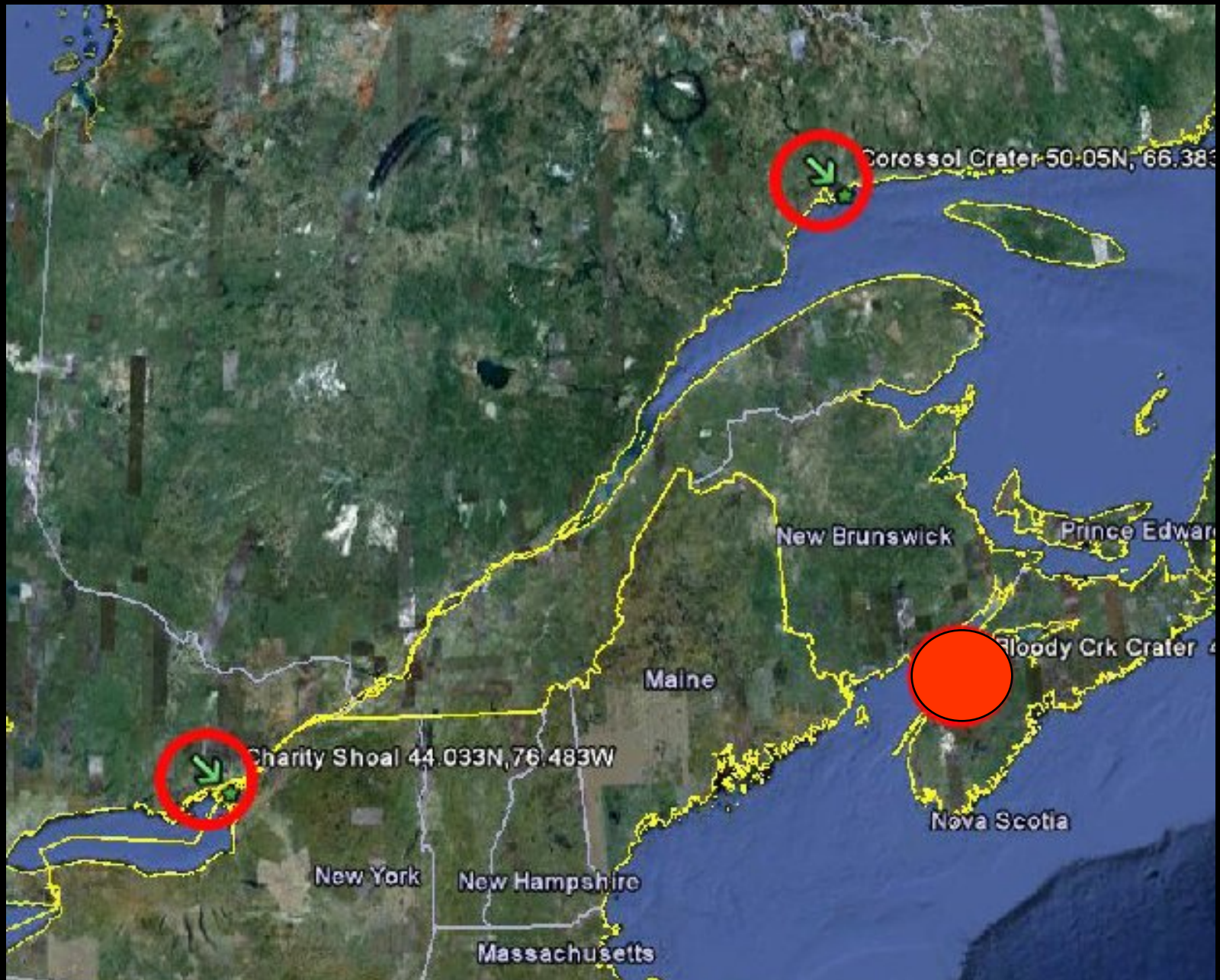
Size: 2 to 40 nm

Shape: rounded or tabular

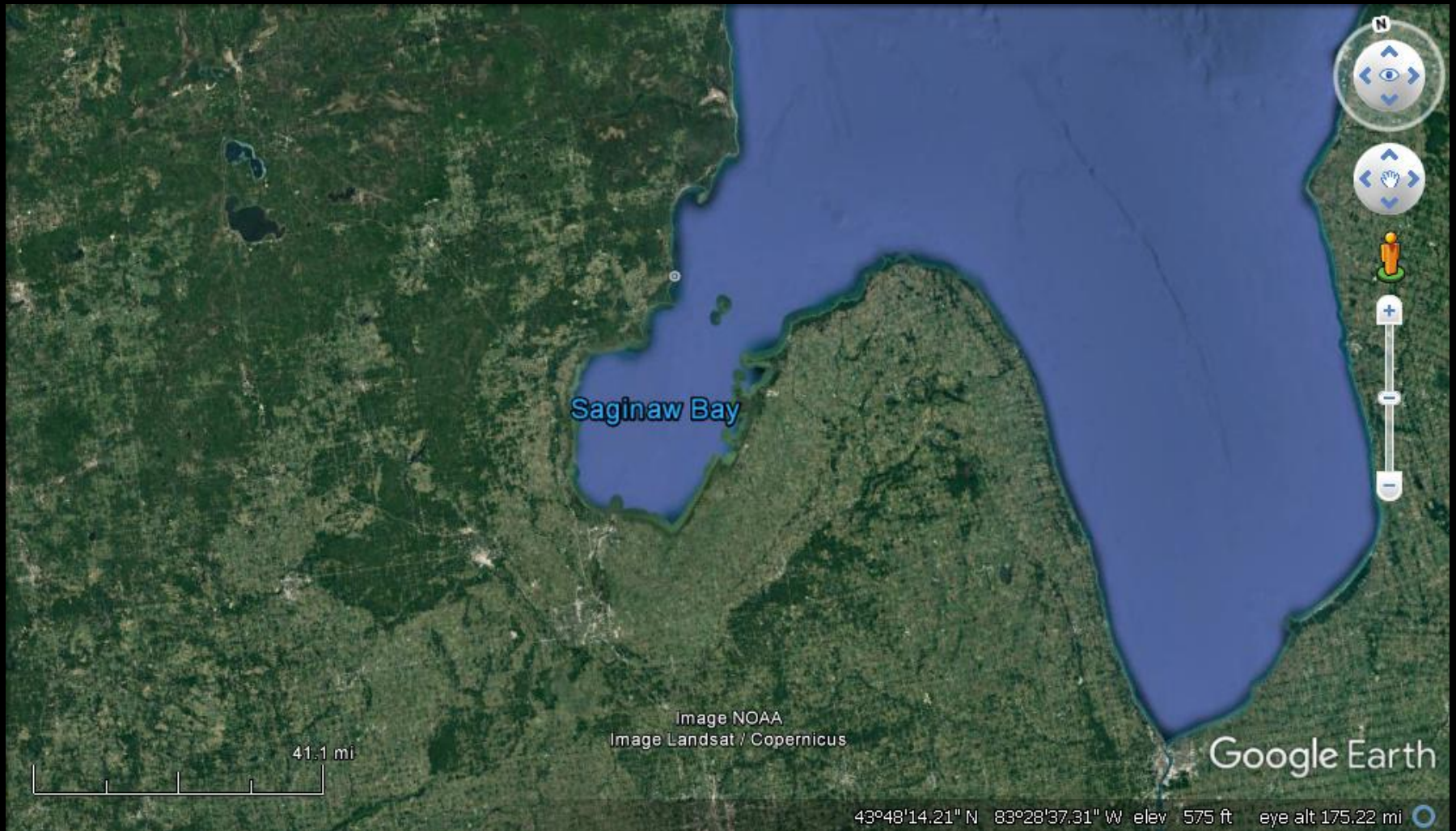
Graphane looking like Lonsdaleite



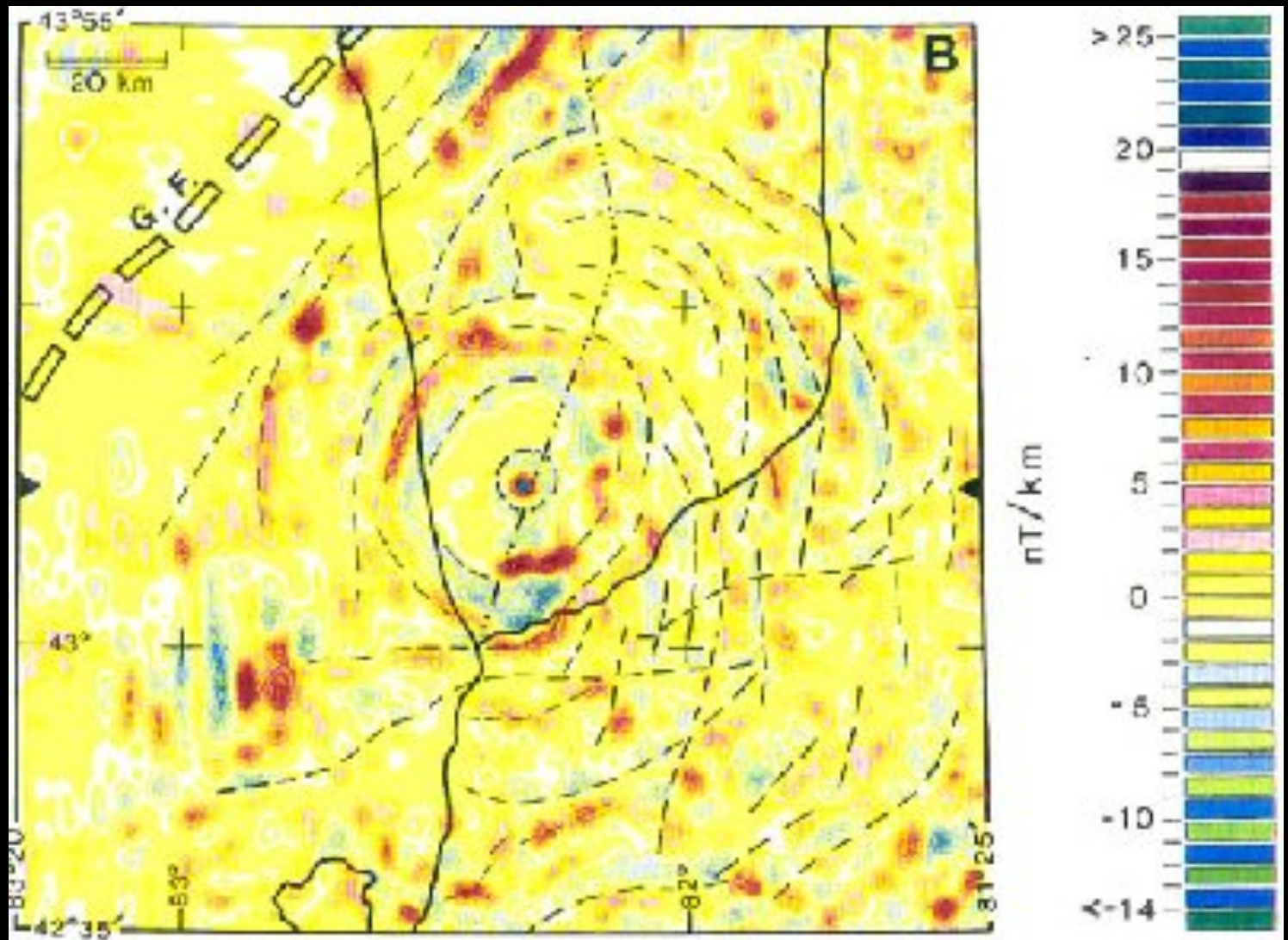
Younger Dryas impact hypothesis



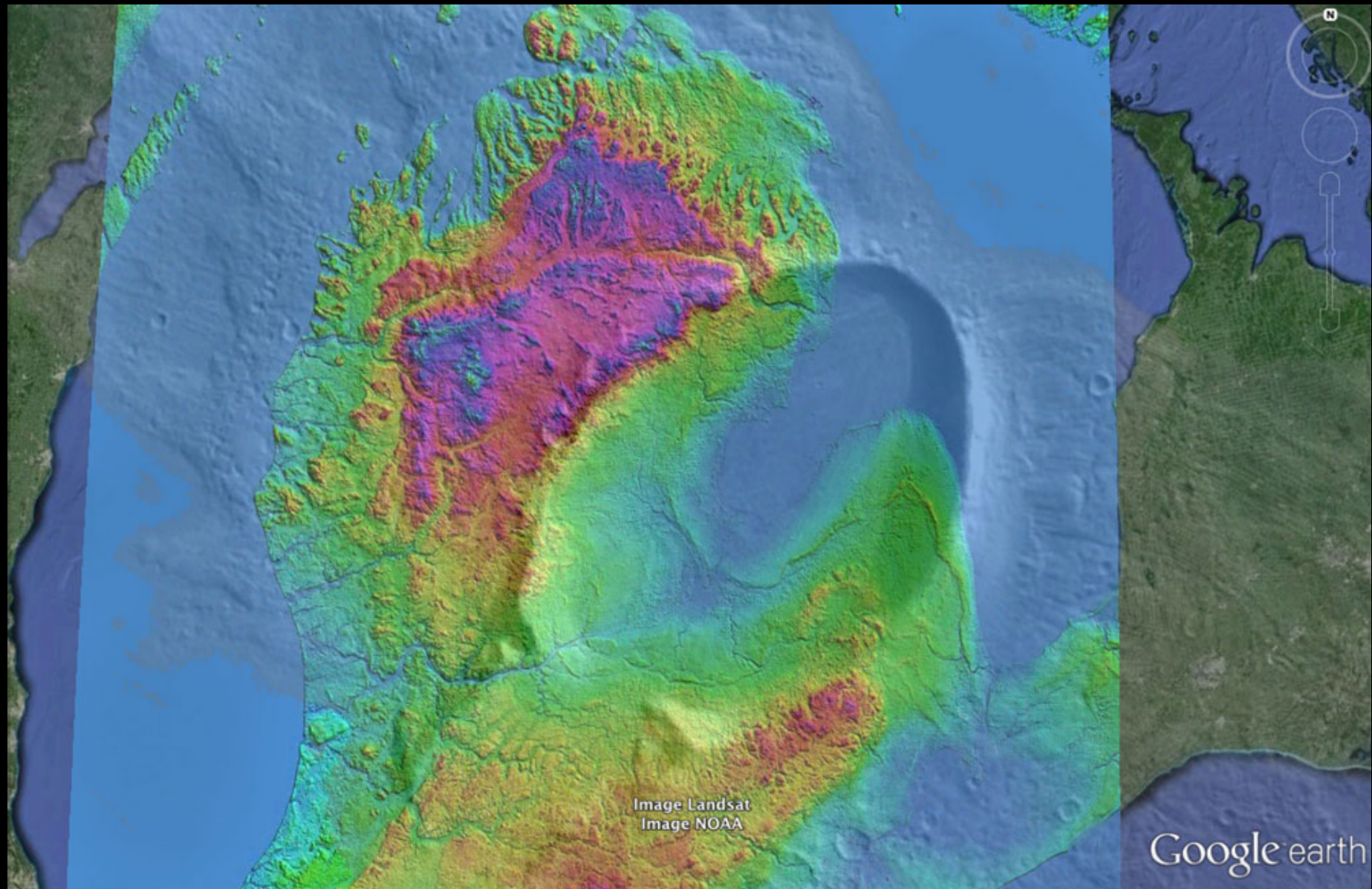
LAKE HURON SOUTH



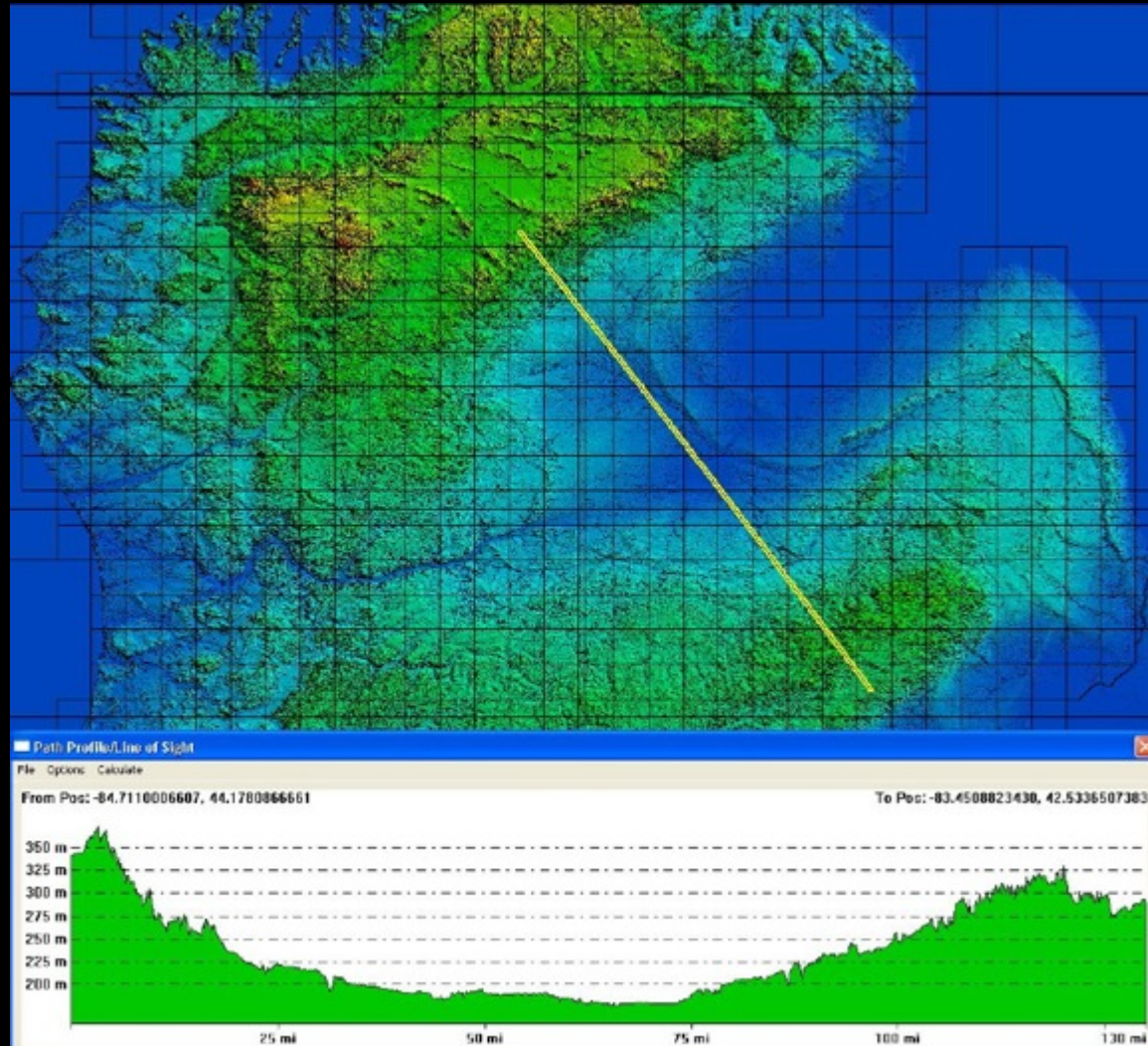
CAN-AM "CRATER"



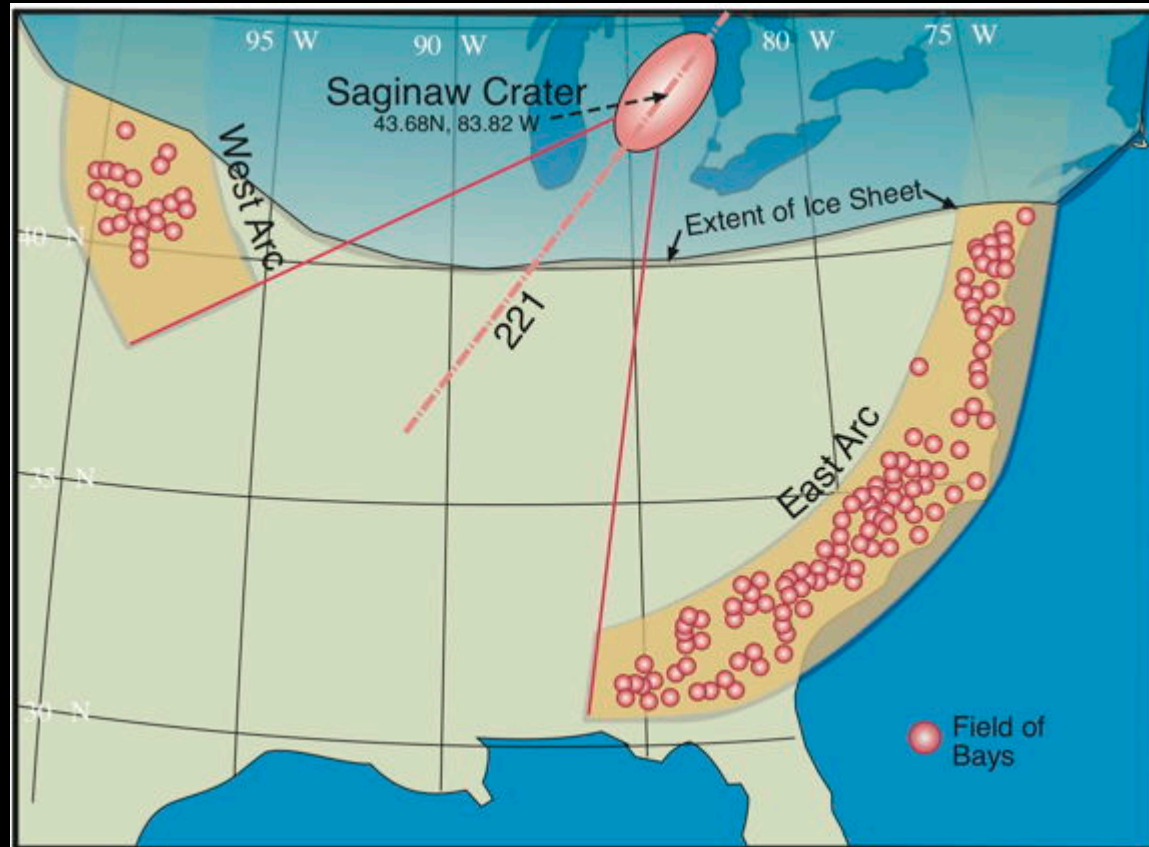
SAGINAW BAY



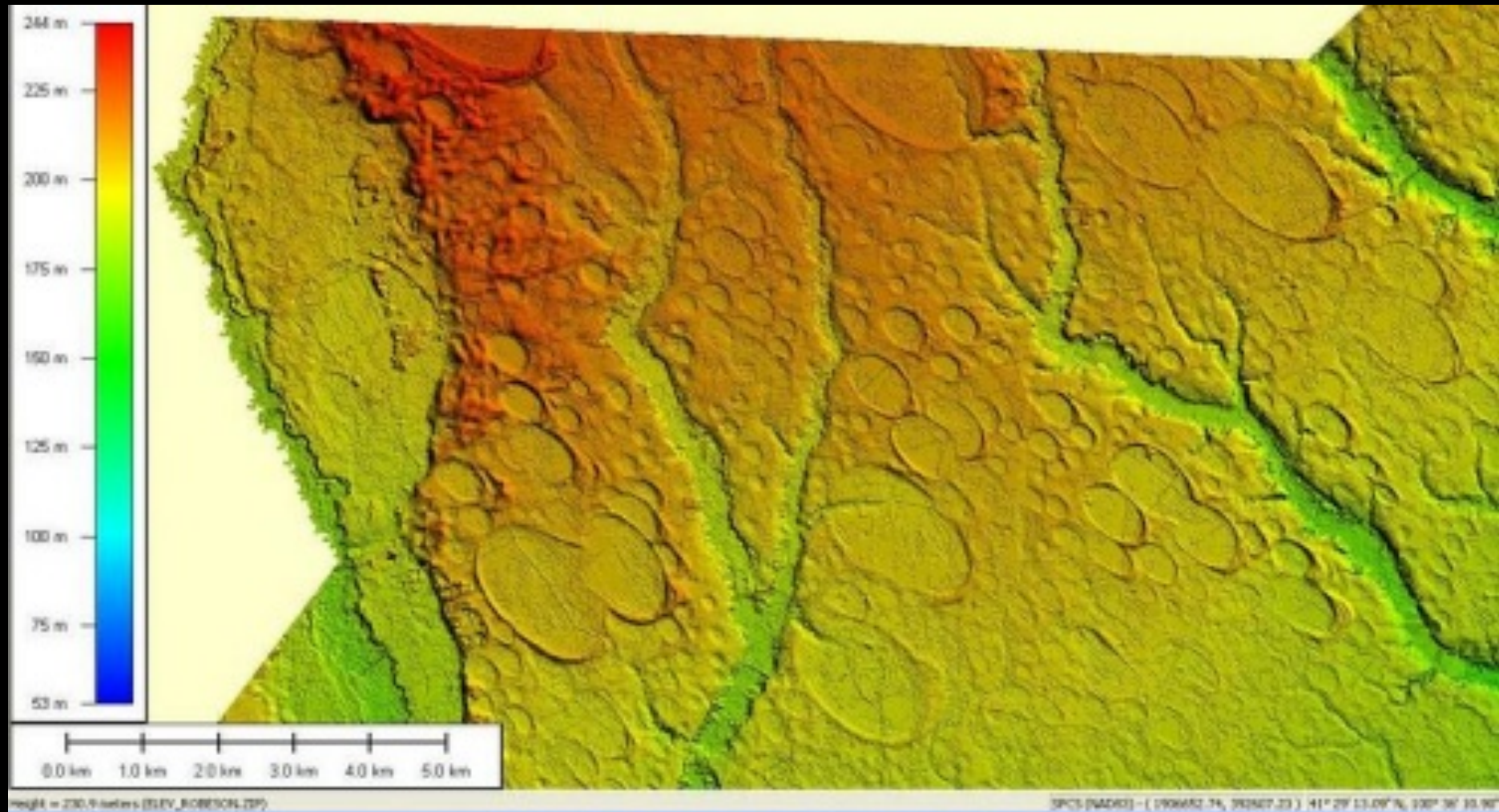
SAGINAW BAY



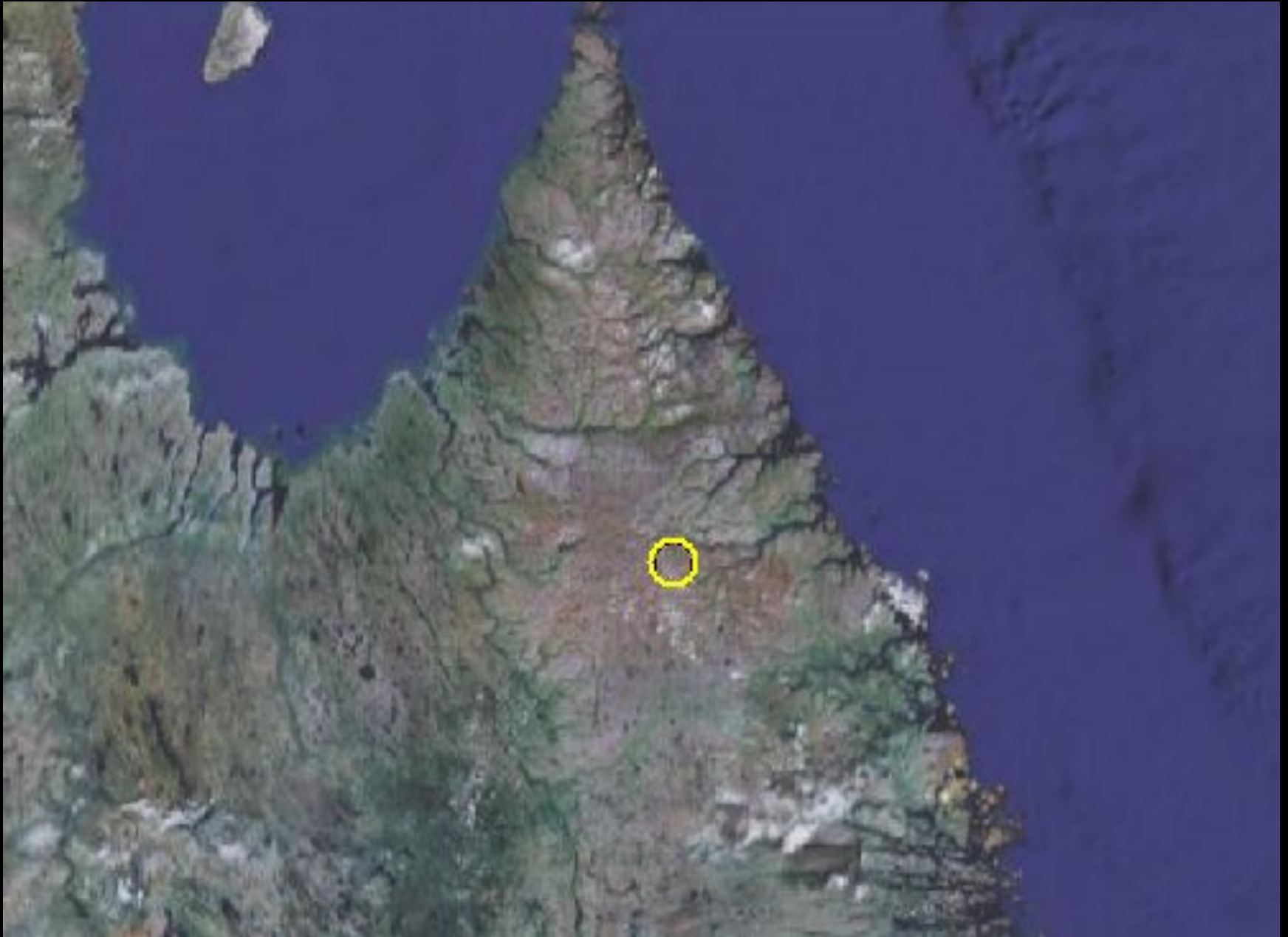
Radial Ejecta Loft Distances



EAST ARC – CAROLINA CAYS



MEREWETHER



MEREWETHER – U BOAT WX STN



MEREWETHER – U BOAT WX STN



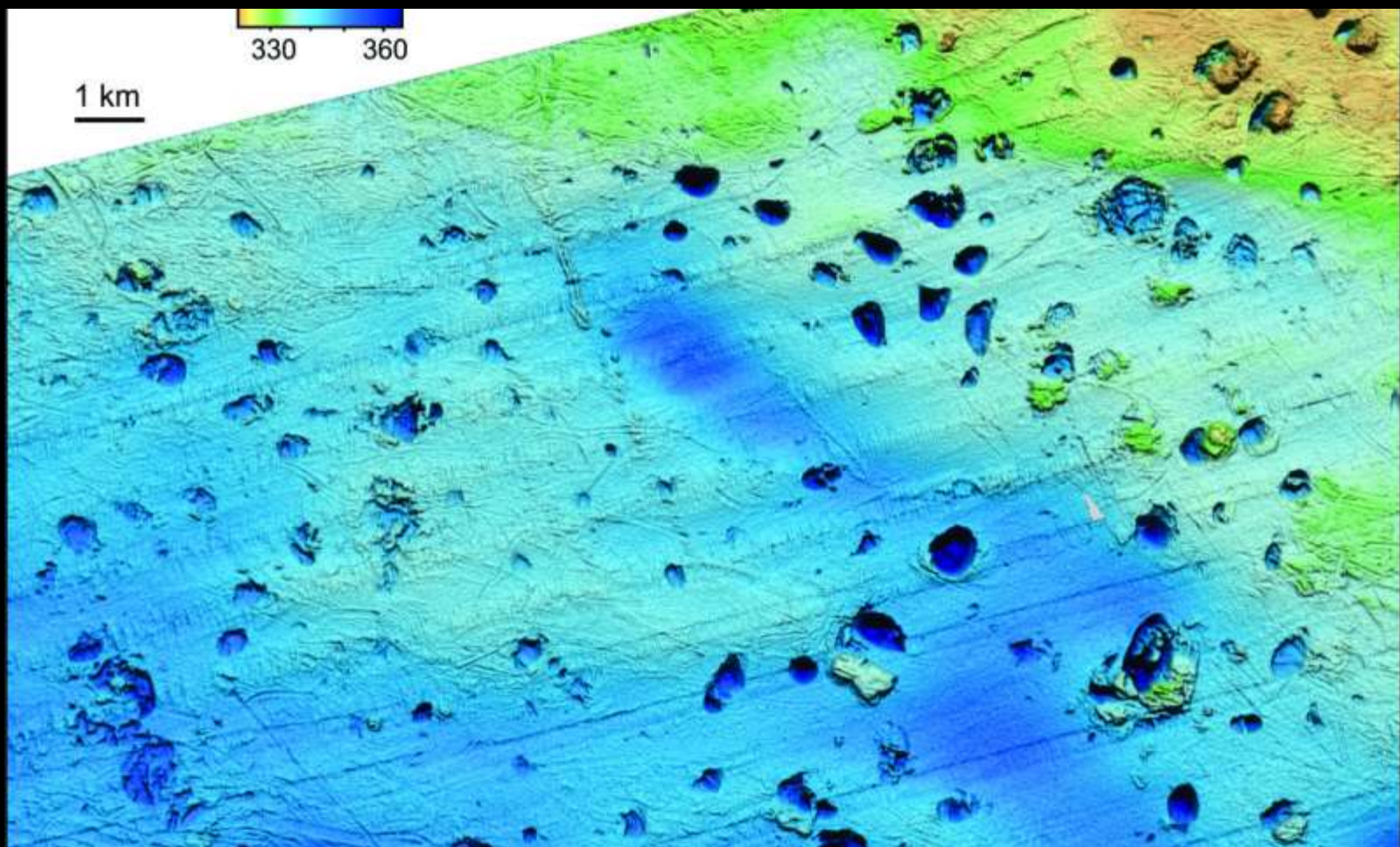
MEREWETHER



YAMAL PENINSULA



METHANE “CRATERS”



YAMAL PENINSULA



MEREWETHER



HOW CAN WE IDENTIFY A CRATER?



Crater exploration, a life-long dream!!



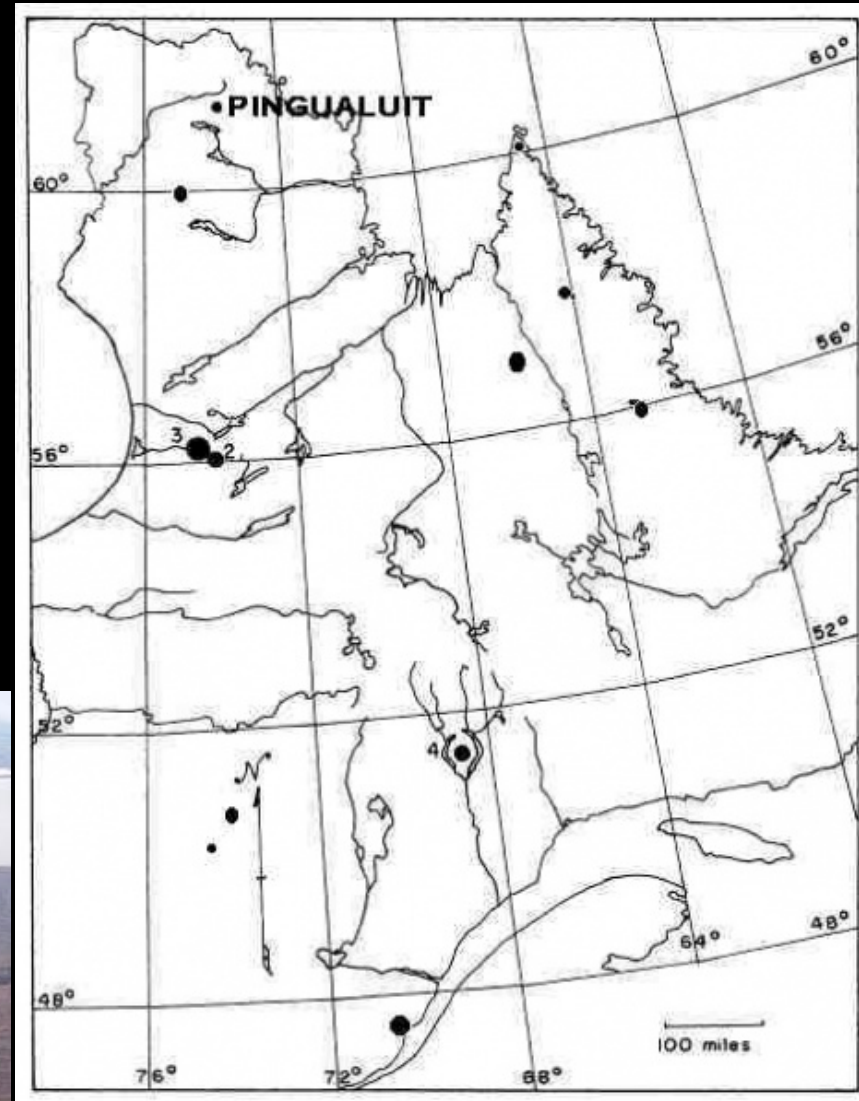
COPYRIGHT MICHAEL DURNING

AIRLINERS.NET

Pingualuit & Barringer, raised crater rims.



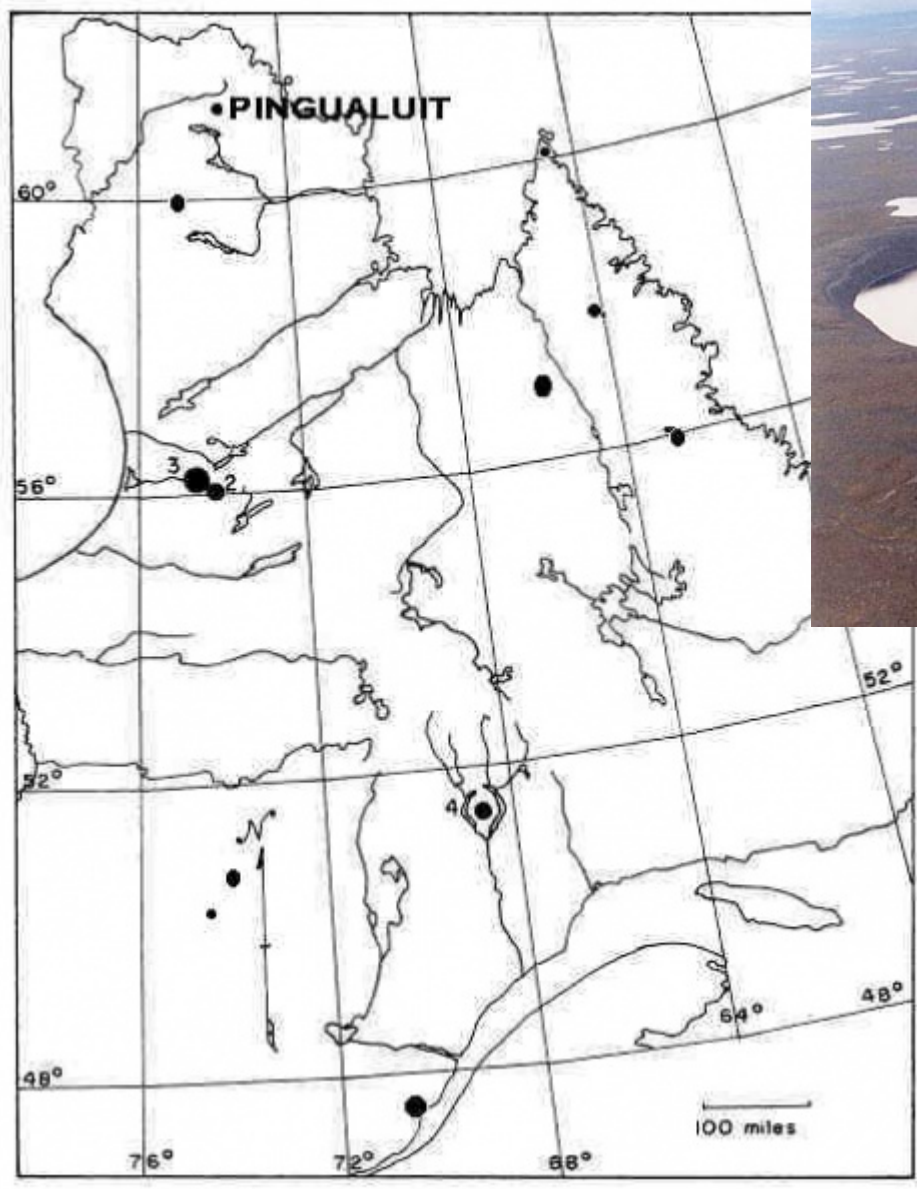
Crater exploration, a life-long dream!!



Crater exploration, a life-long dream!!



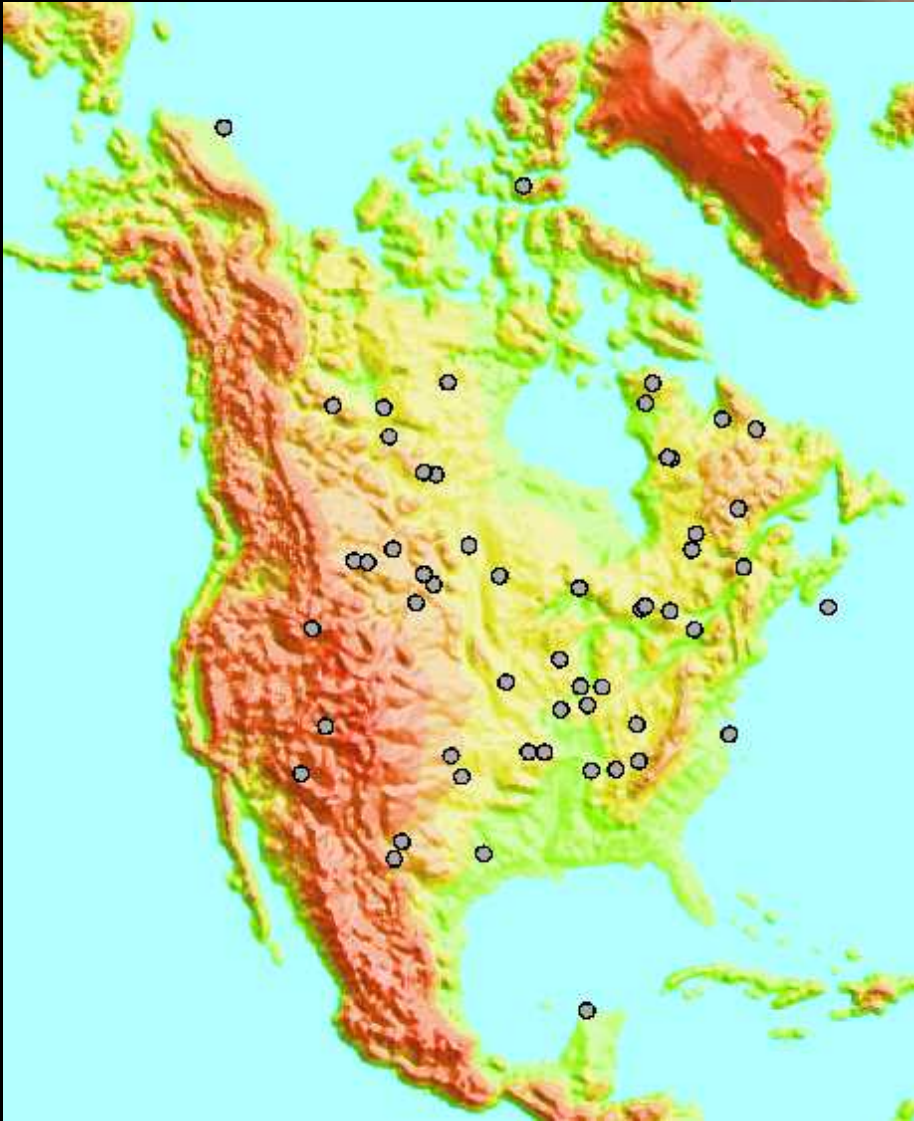
Pingualuit , Northern Quebec – 1.4 Ma – 3.44 km.



Pingualuit , Northern Quebec – 1.4 Ma – 3.44 km.



BARRINGER



BARRINGER



BARRINGER



Barringer , Arizona USA – 49,000 years



Barringer , Arizona USA – 49,000 years



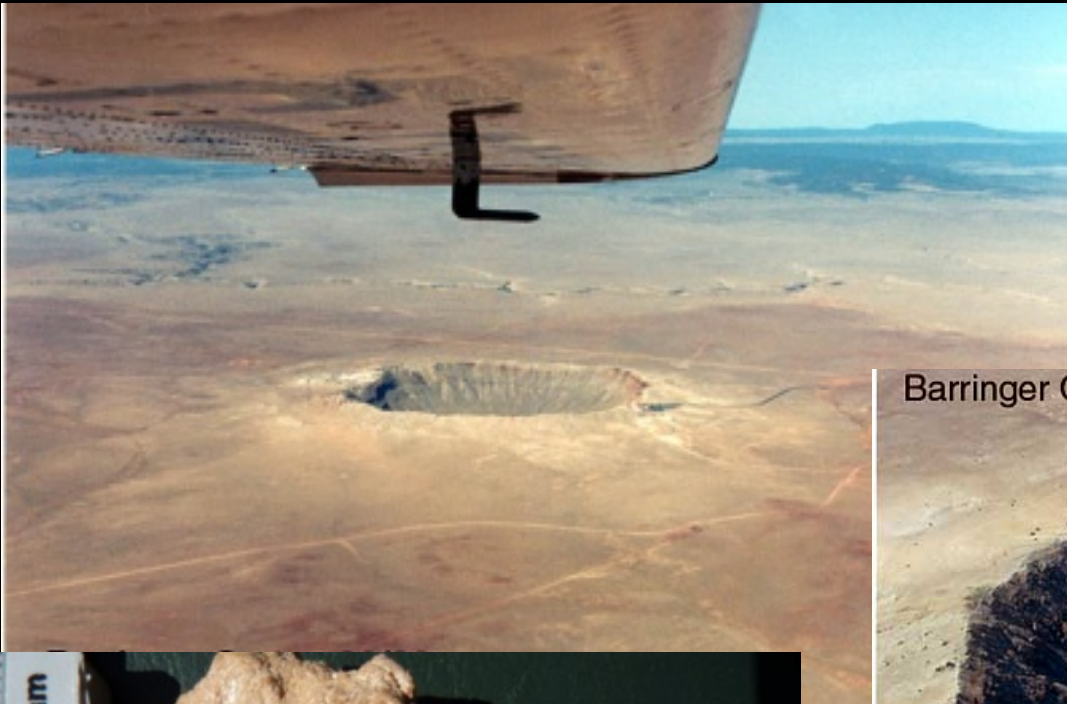
Barringer Crater, 08/96



Barringer Crater, 08/96



Barringer , Arizona USA – 49,000 years



Barringer Crater, 08/96



Sudbury, Ontario – 1852 Ma - ~250 km.



Sudbury, Ontario – 1852 Ma - ~250 km.



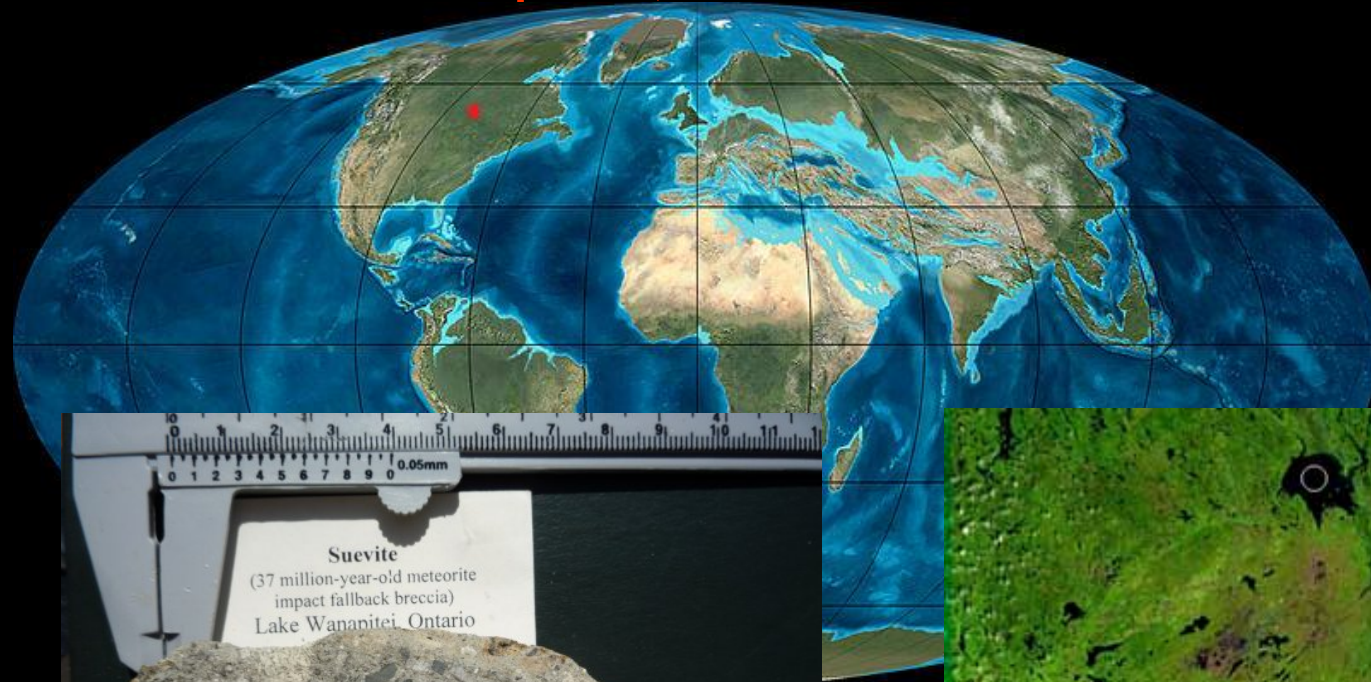
SUDBURY – WANAPETEI



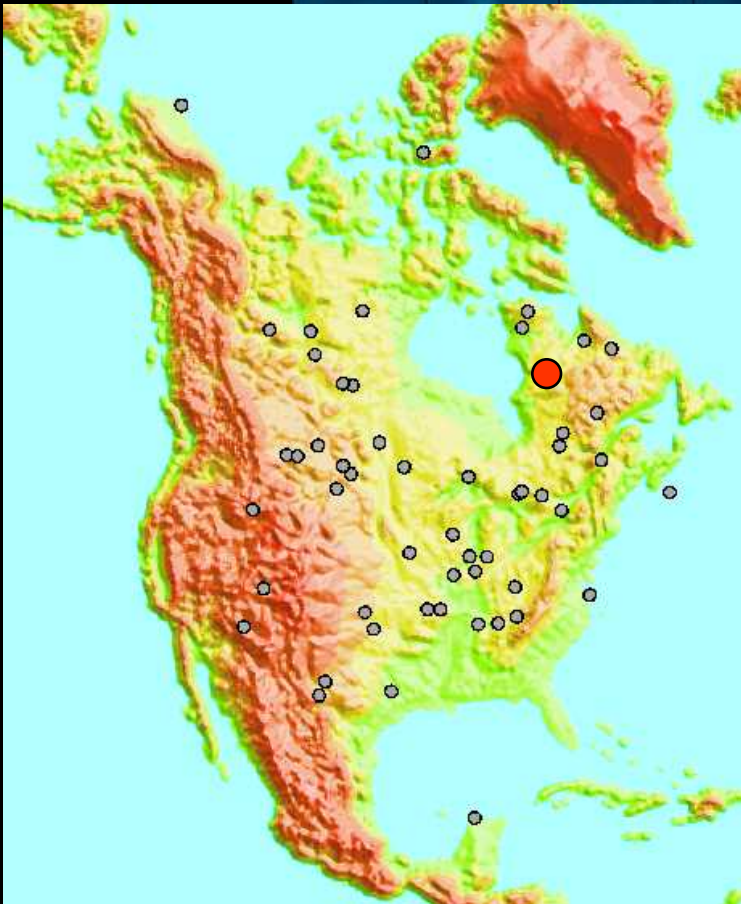
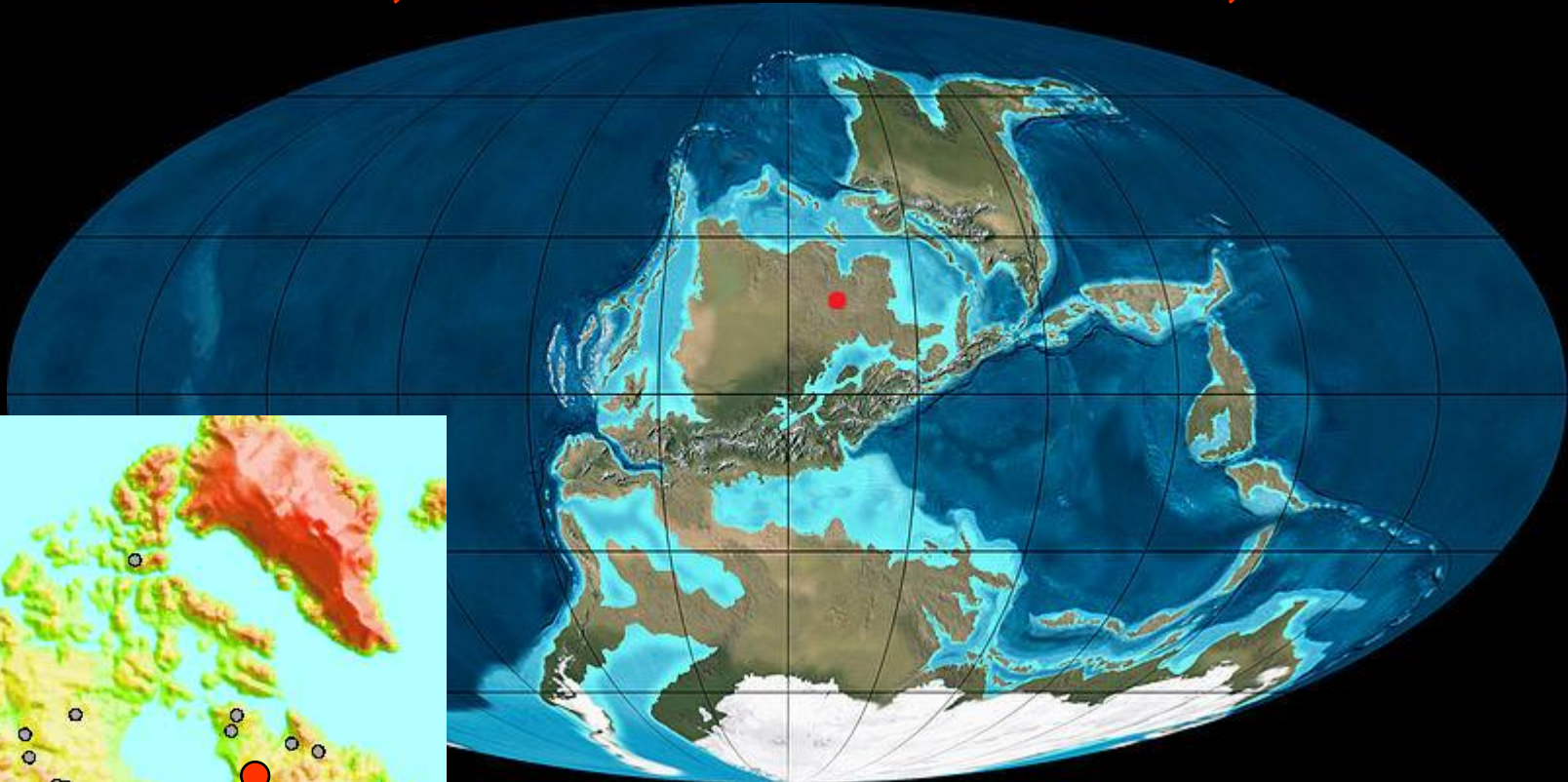
SUDBURY – WANAPETEI



Wanapitei, Ontario – 37.2 Ma - > 3 km.



Clearwater craters, Quebec – 290 Ma – w32, e26 km



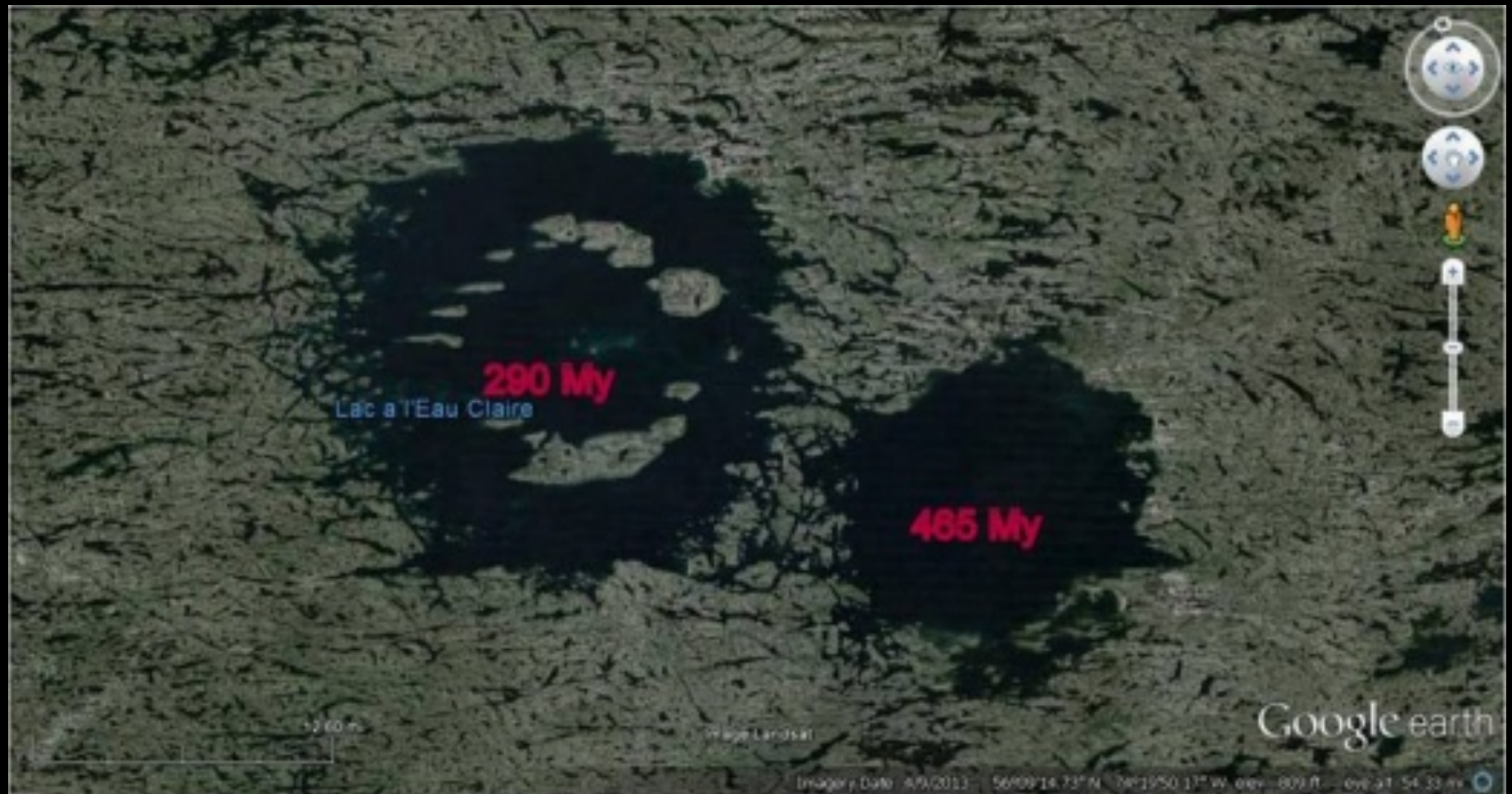
Clearwater craters, Quebec – 290 Ma – w32, e26 km



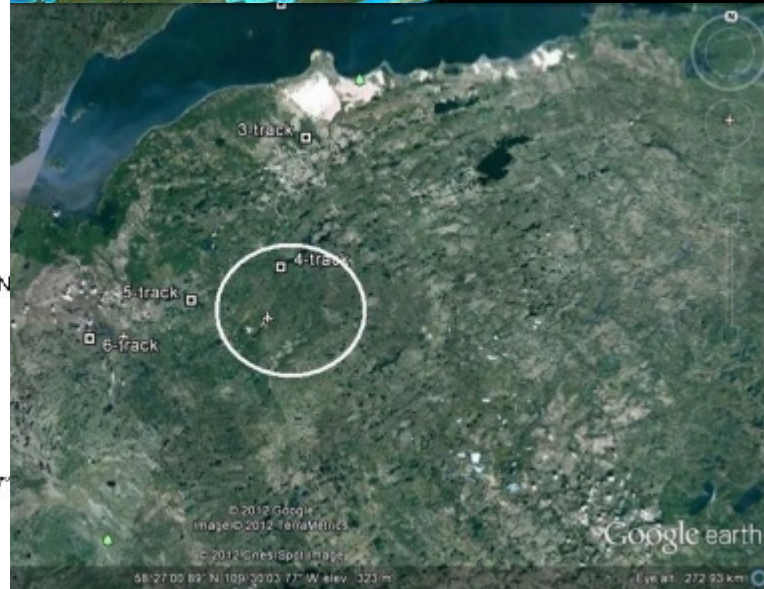
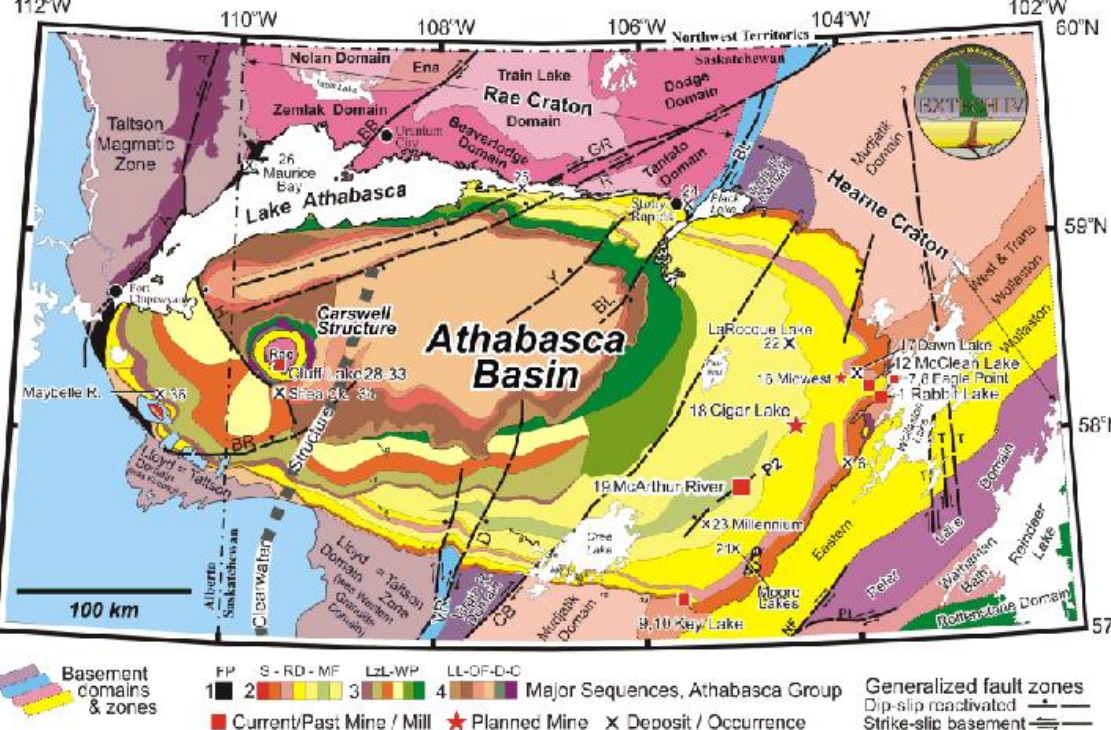
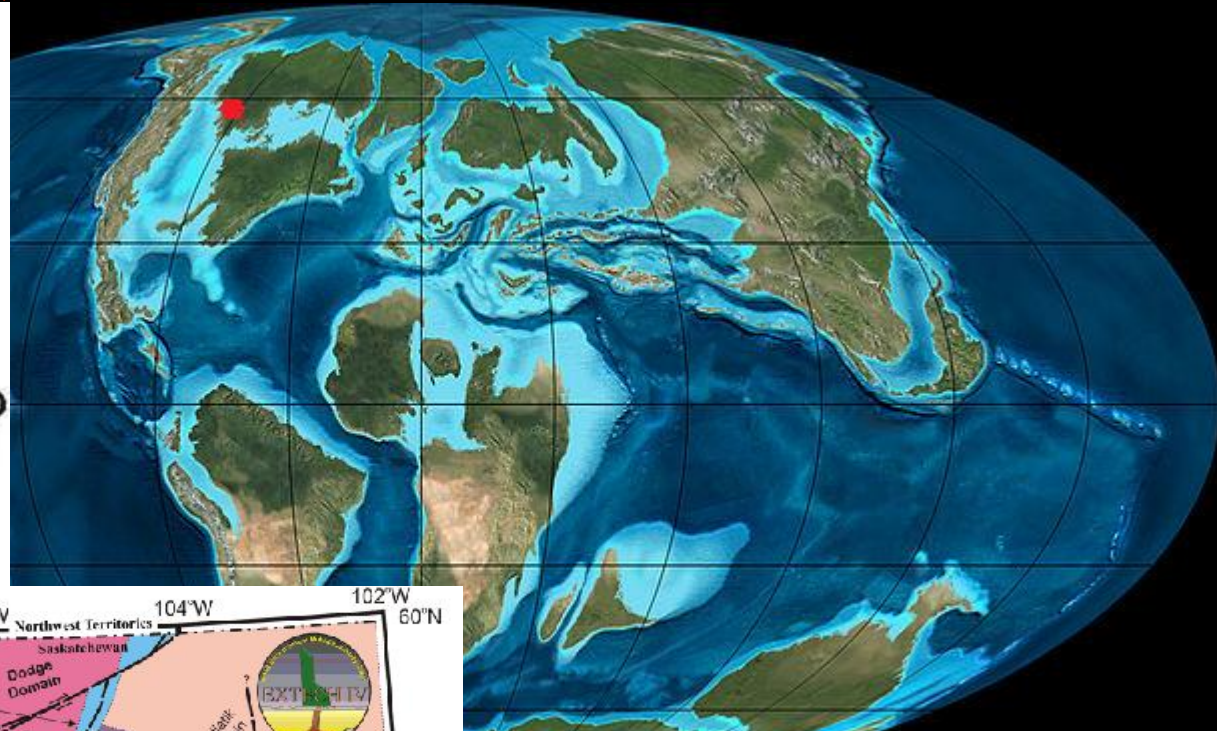
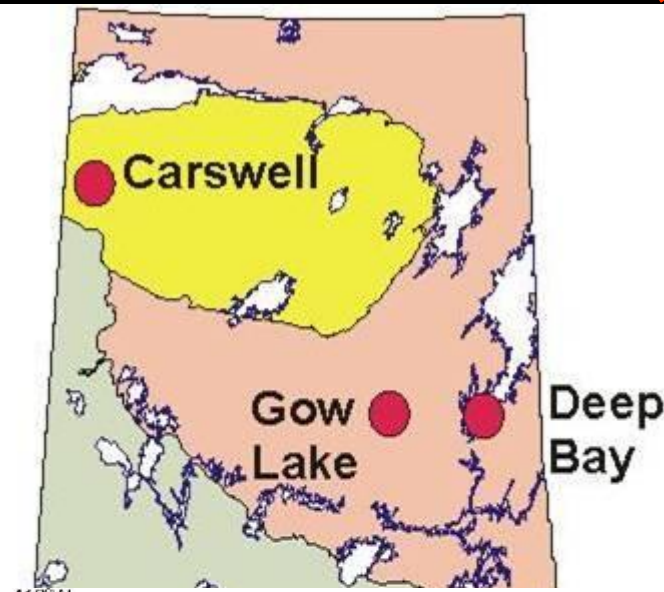
CLEARWATER CRATERS



Clearwater Impact Craters



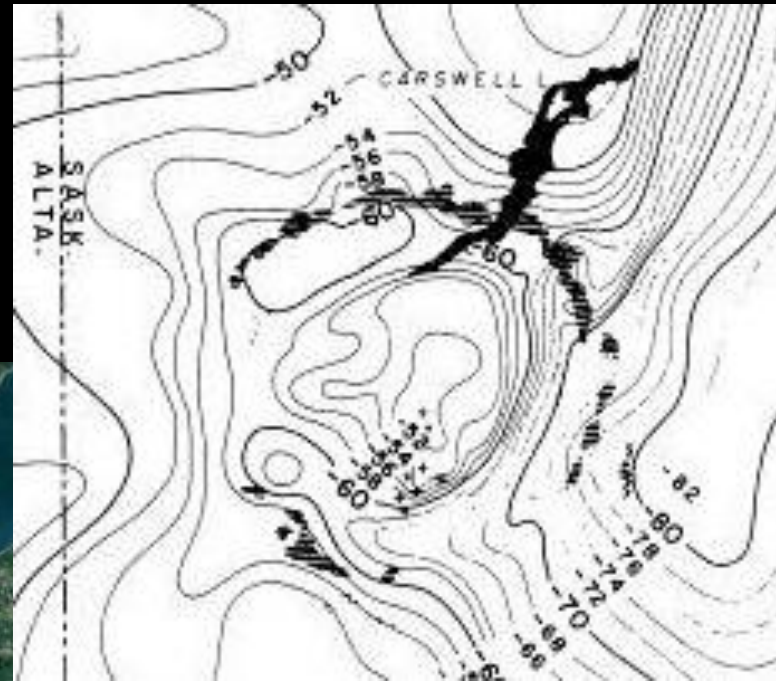
Carswell, Sask. – 115 Ma – 39 km



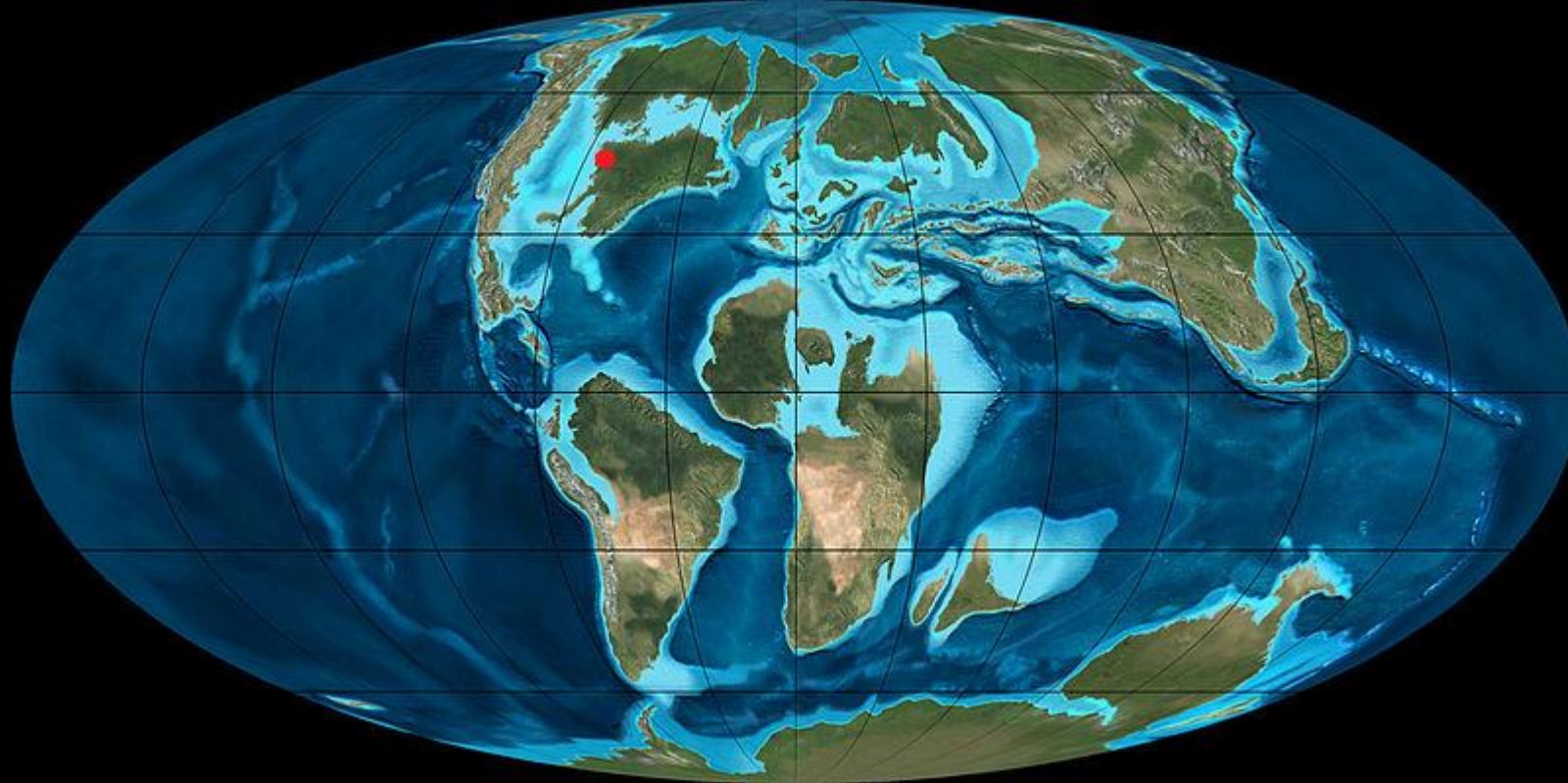
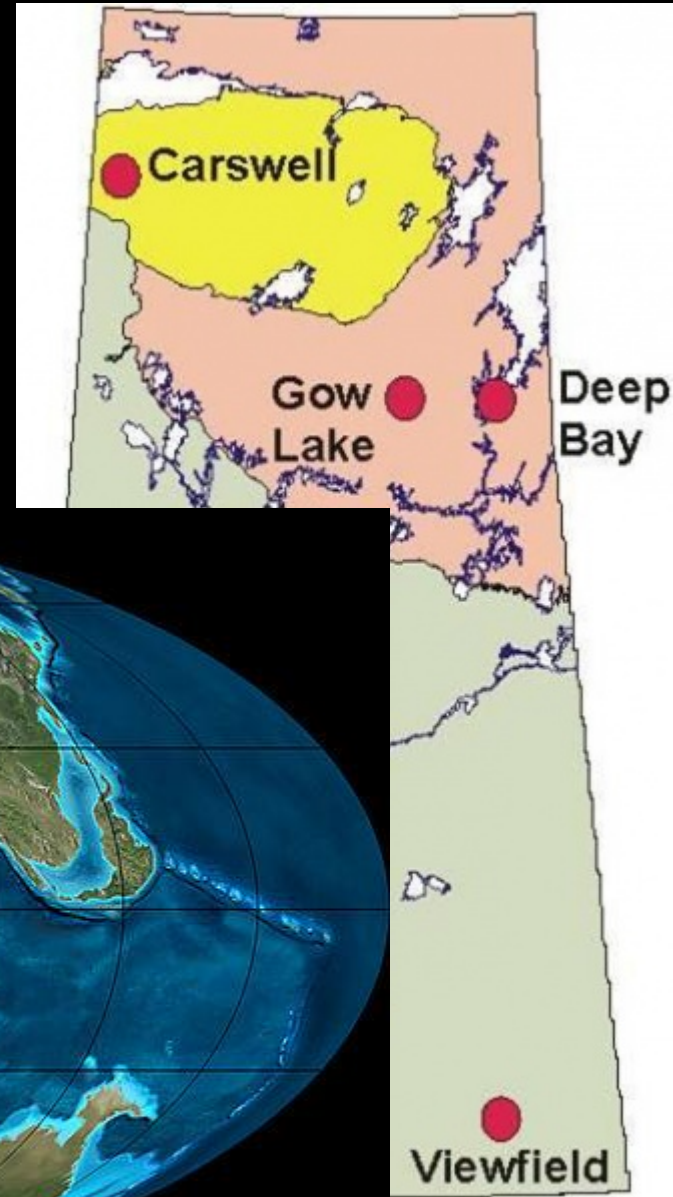
Carswell, Sask. – 115 Ma – 39 km



CARSWELL, SASKATCHEWAN



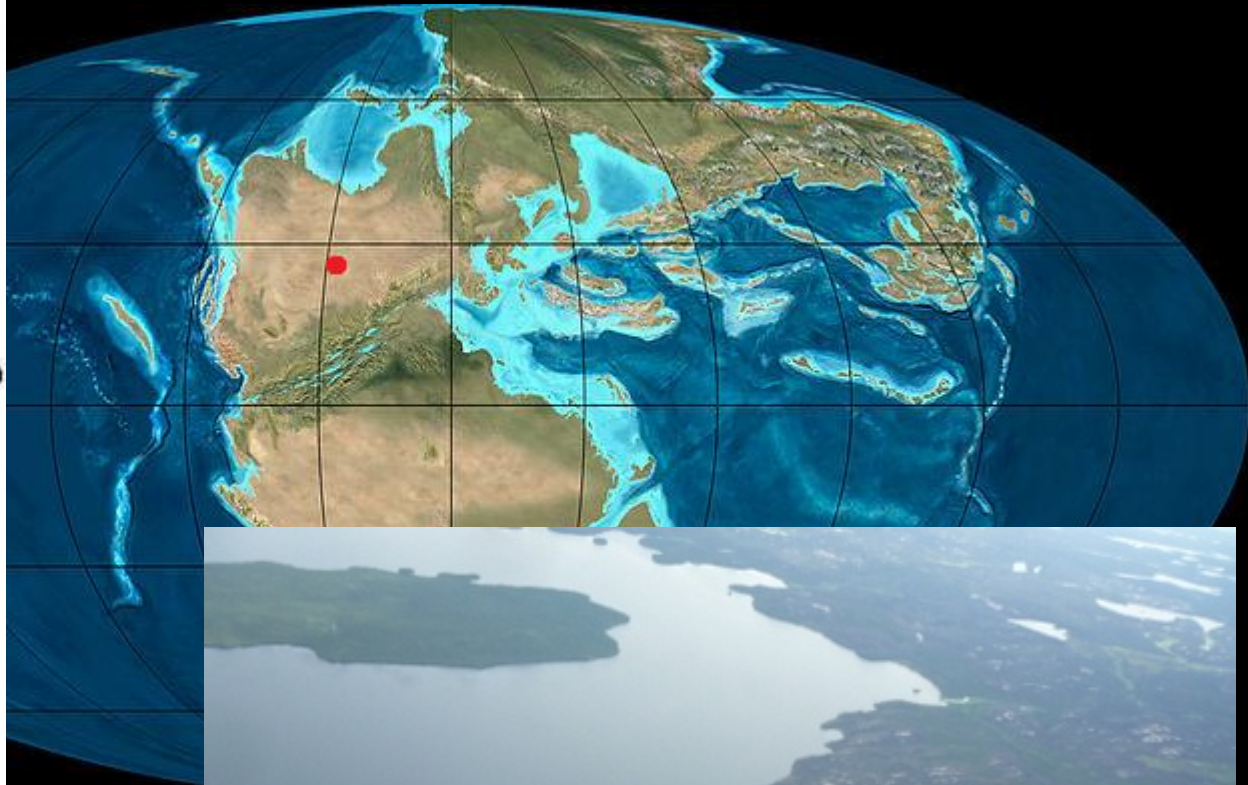
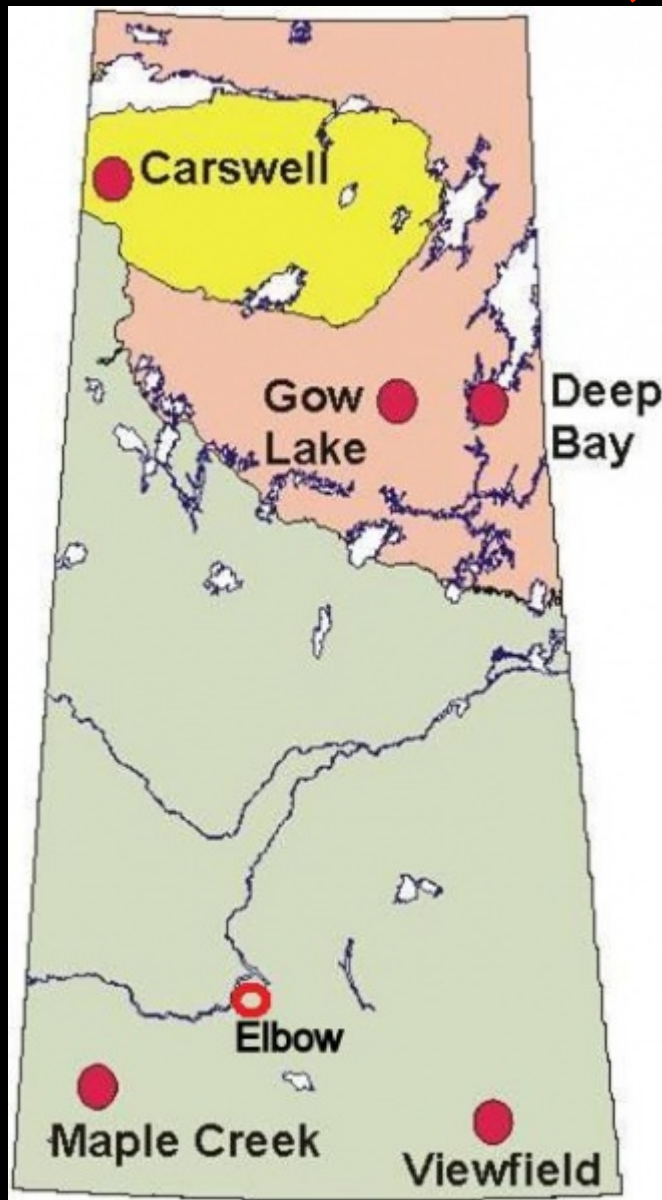
Deep Bay, Sask. – 99 Ma – 9.5 km.



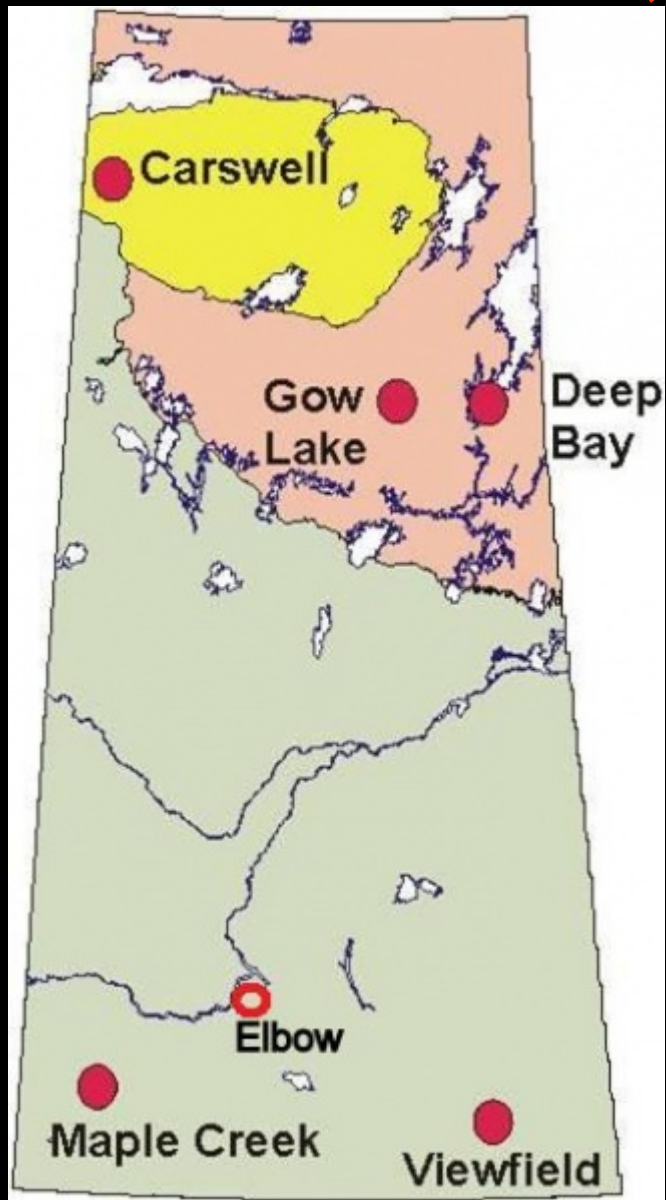
Deep Bay, Sask. – 99 Ma – 9.5 km.



Gow, Sask. - 250 Ma - 5 km.



Elbow, Sask. – 395 Ma – 8 km.

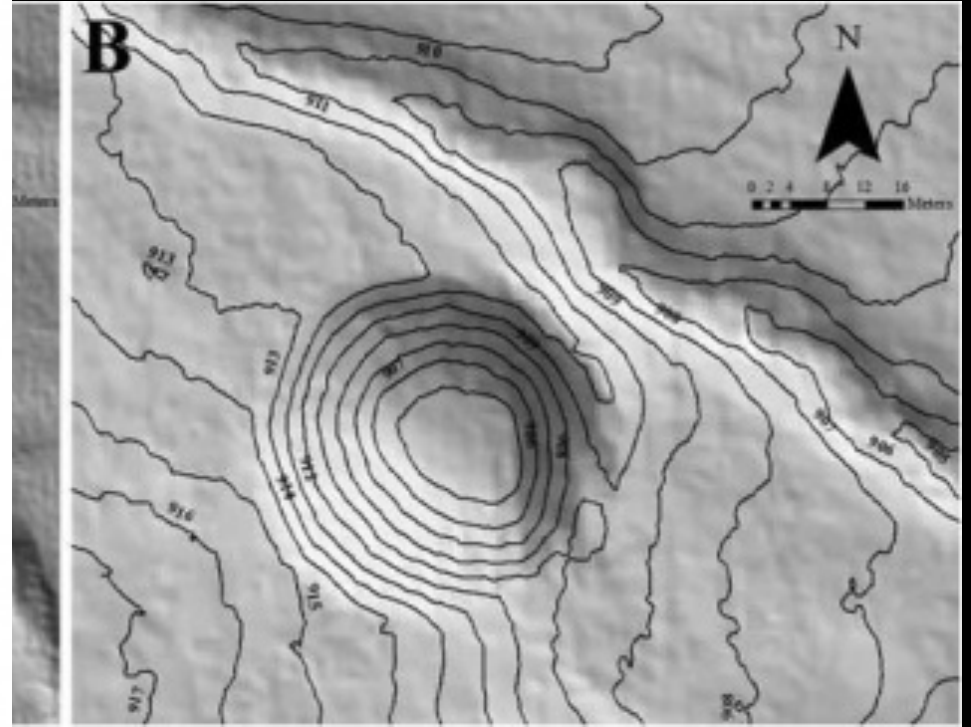
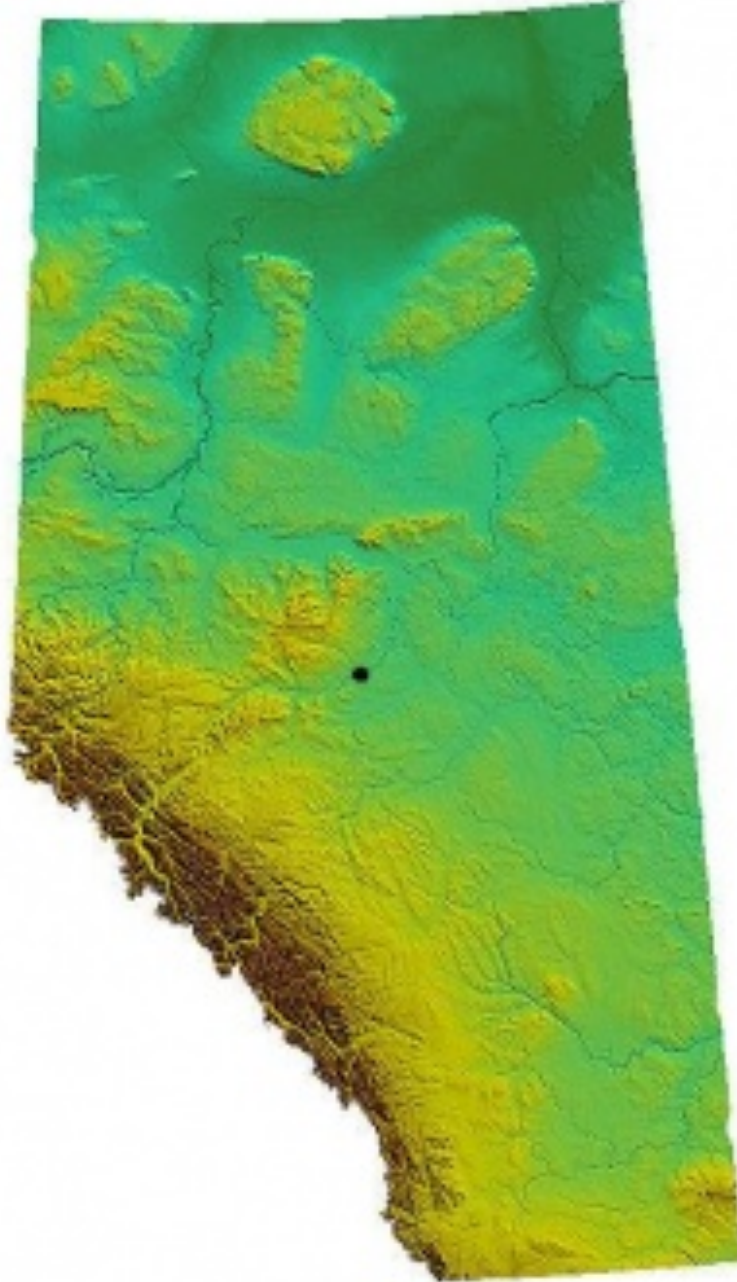


Elbow, Sask. – 395 Ma – 8 km.

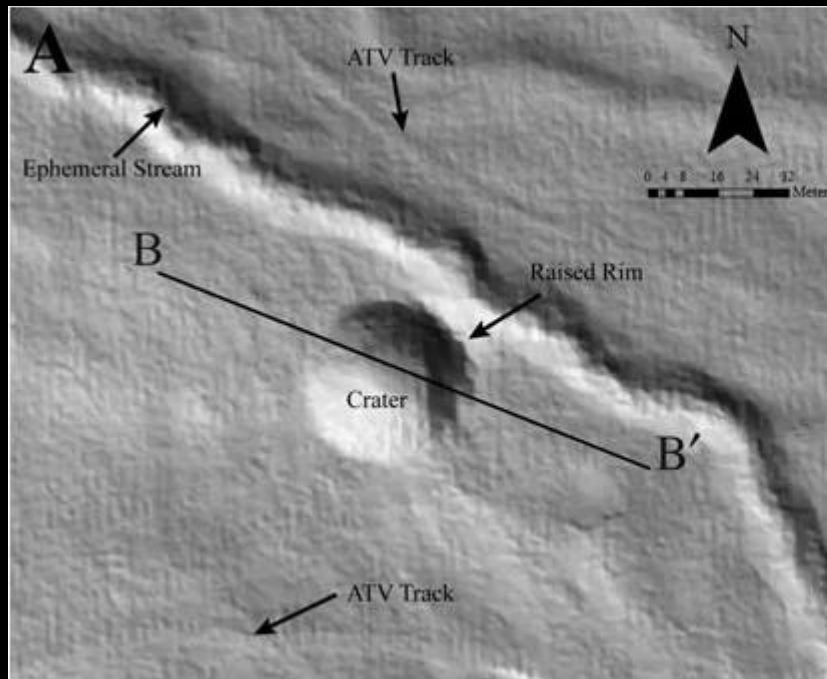


WHITECOURT

A
Ephe



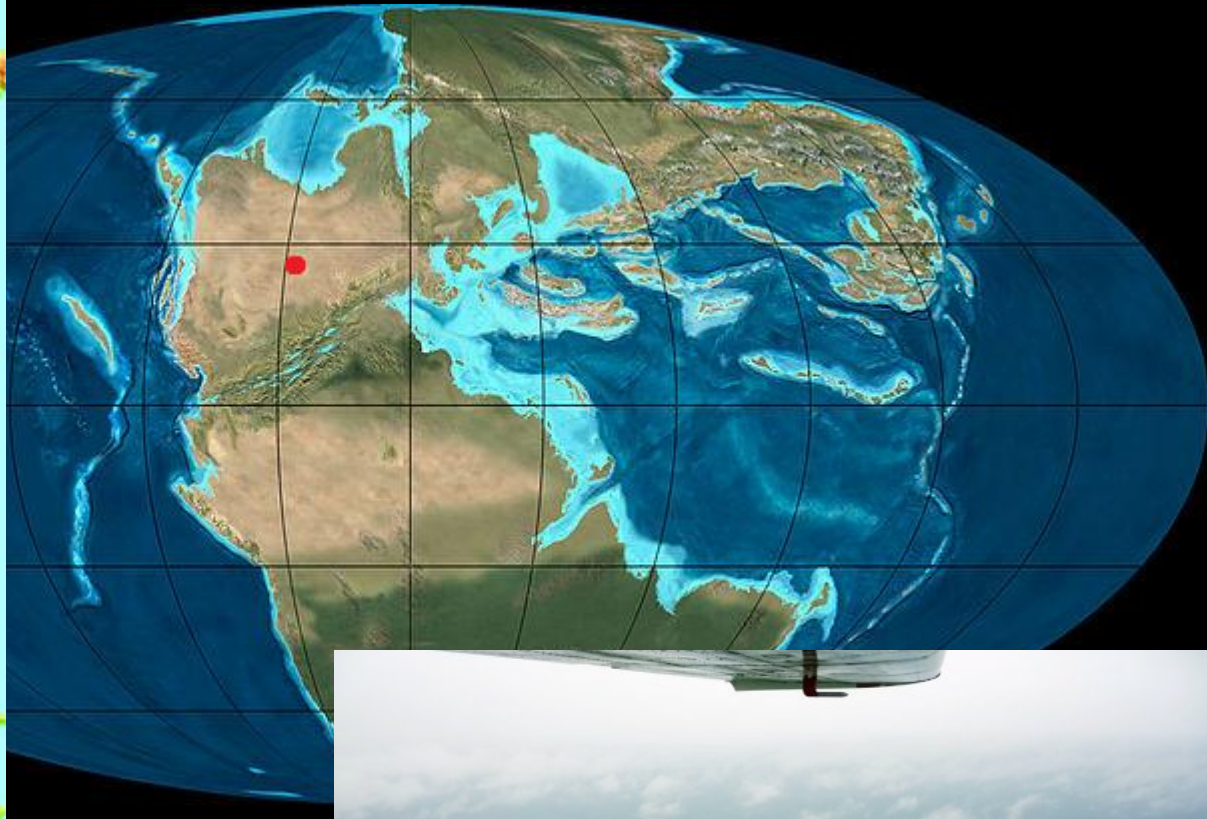
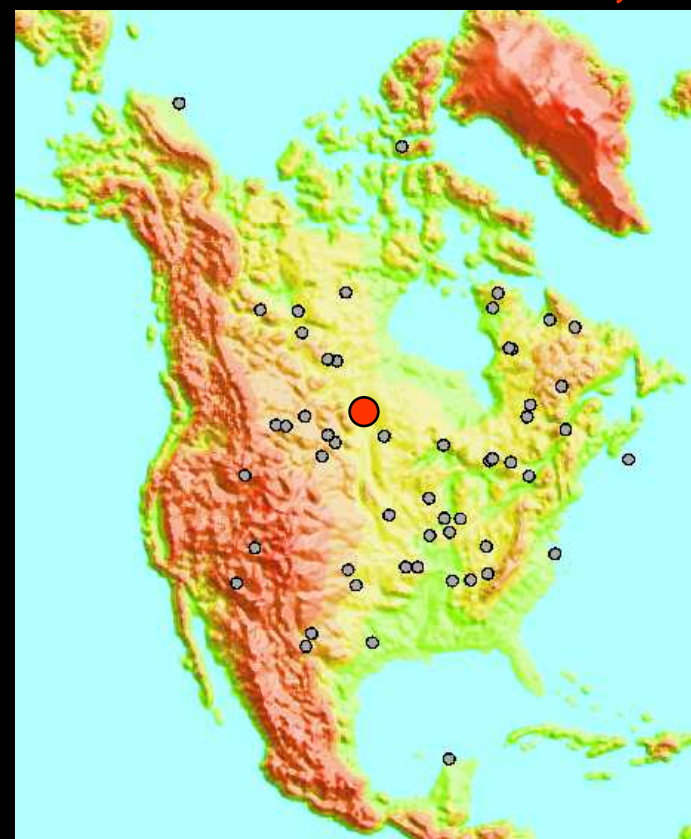
Whitecourt, Alberta ~1,130 years – 36 m.



WHITECOURT



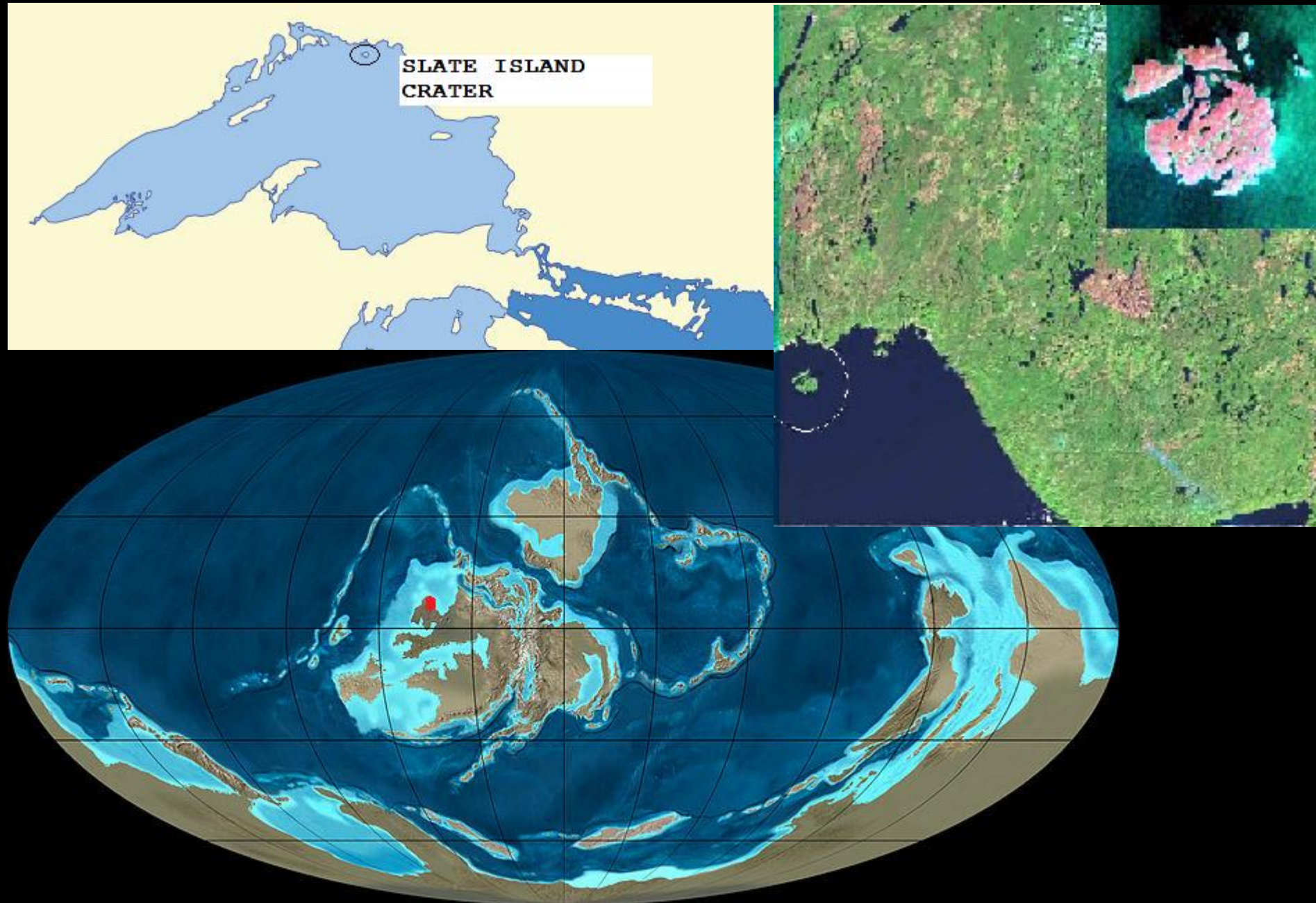
St. Martin, Manitoba - 219 Ma - ~40 km.



Slate Islands, Ontario – 436 Ma – 32 km.



Slate Islands, Ontario – 436 Ma – 32 km.



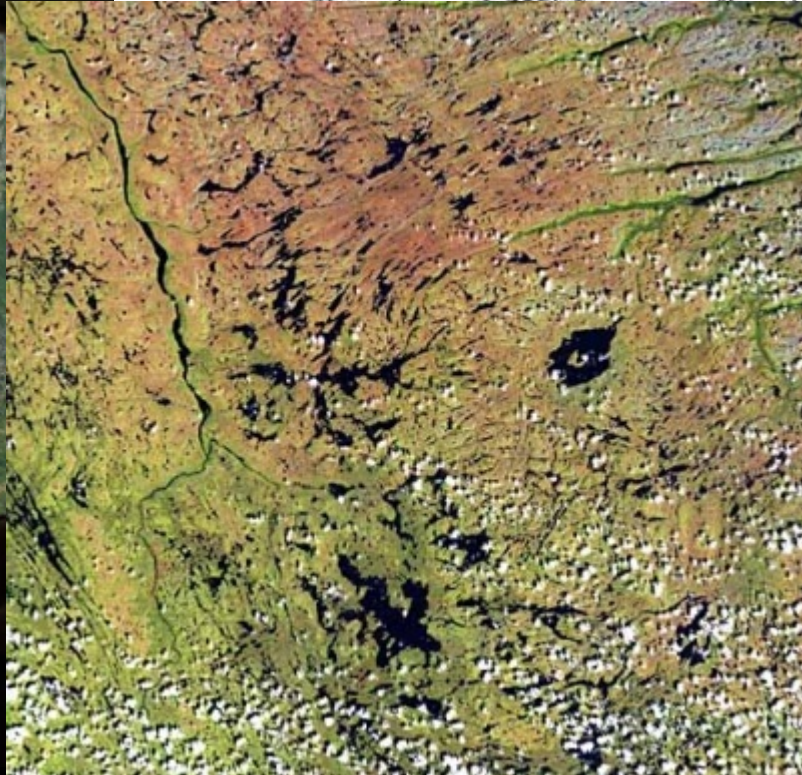
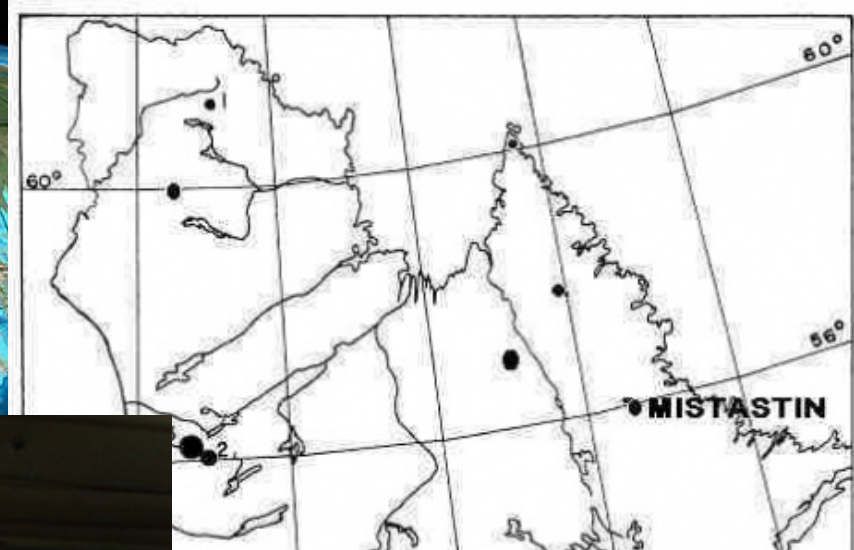
Slate Islands, Ontario – 436 Ma – 32 km.



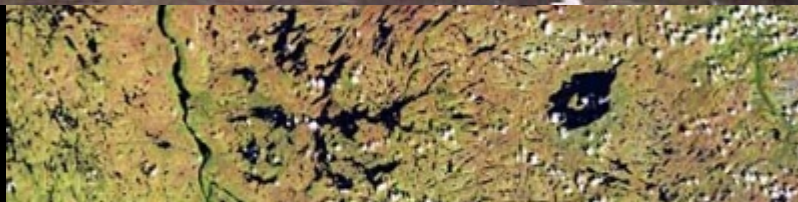
Slate Islands, Ontario – 436 Ma – 32 km.



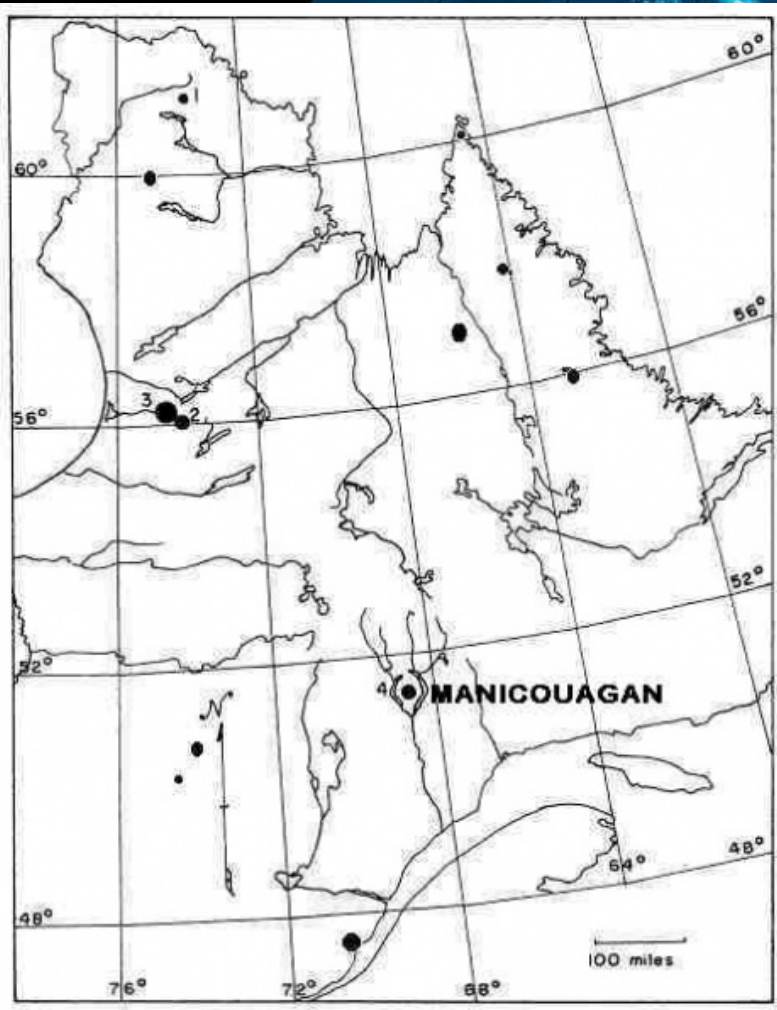
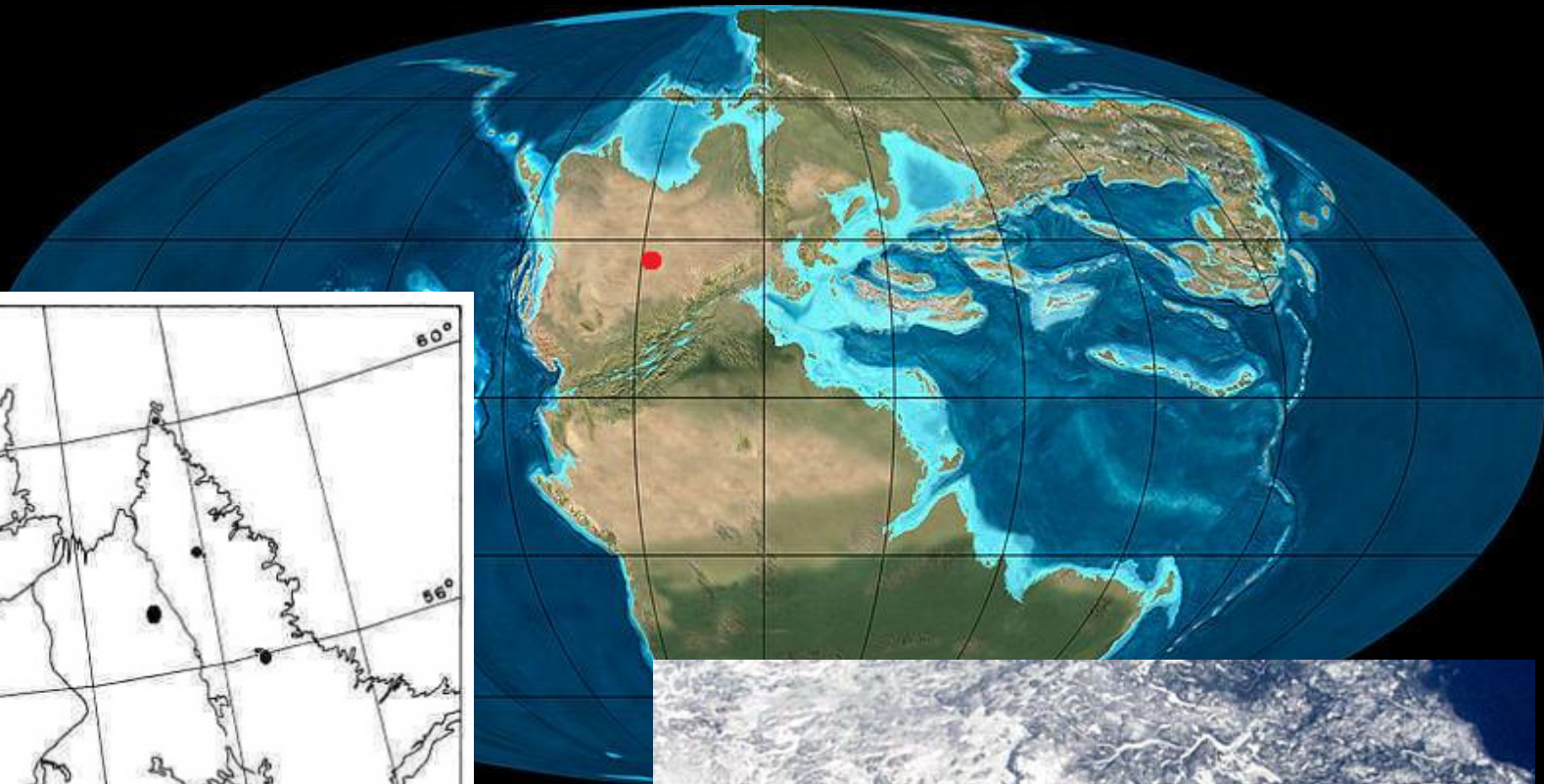
Mistastin, Labrador – 36.4 Ma – 28 km.



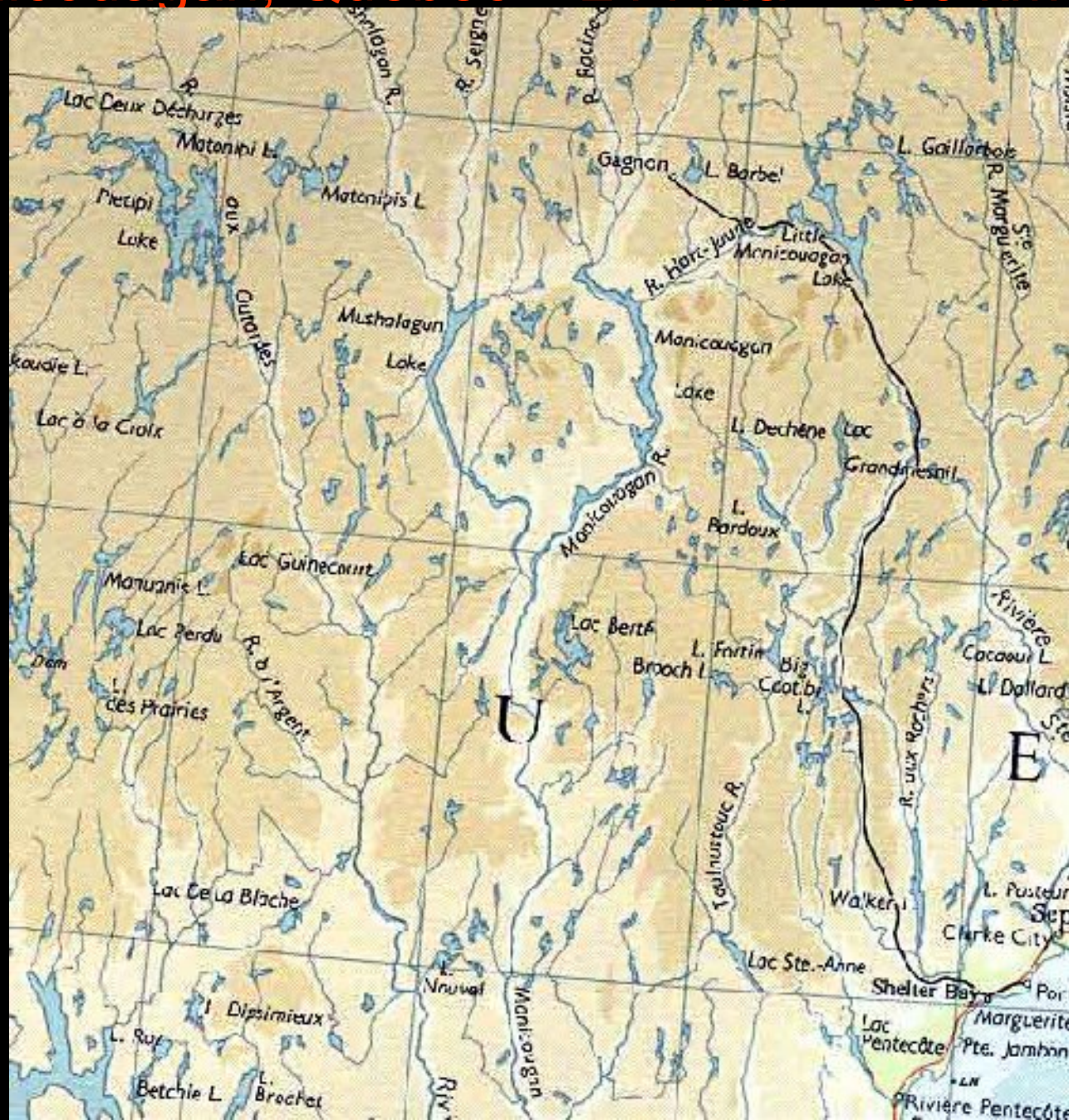
Mistastin, Labrador – 36.4 Ma – 28 km.



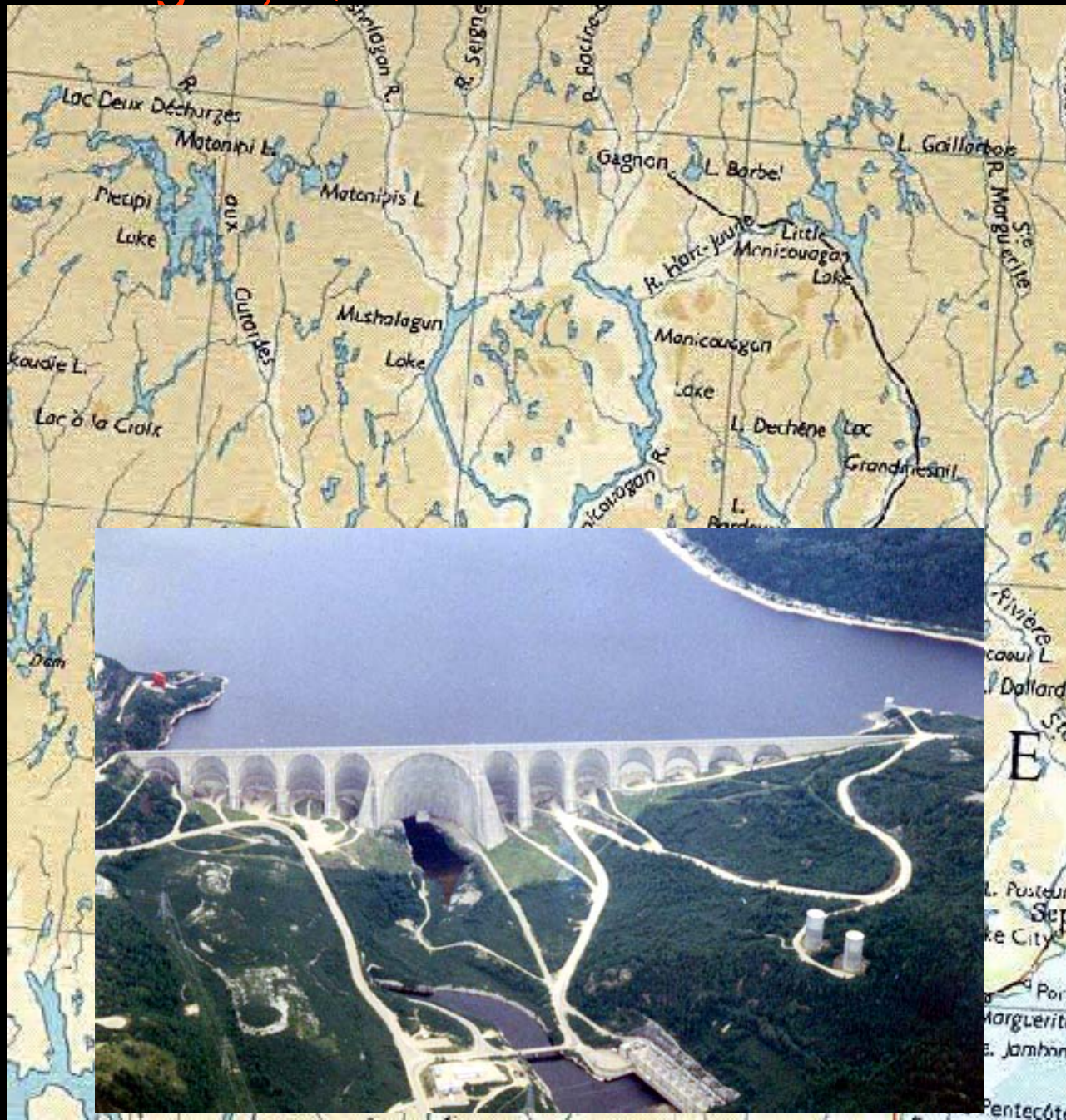
Manicouagan, Quebec – 214 Ma – 100 km.



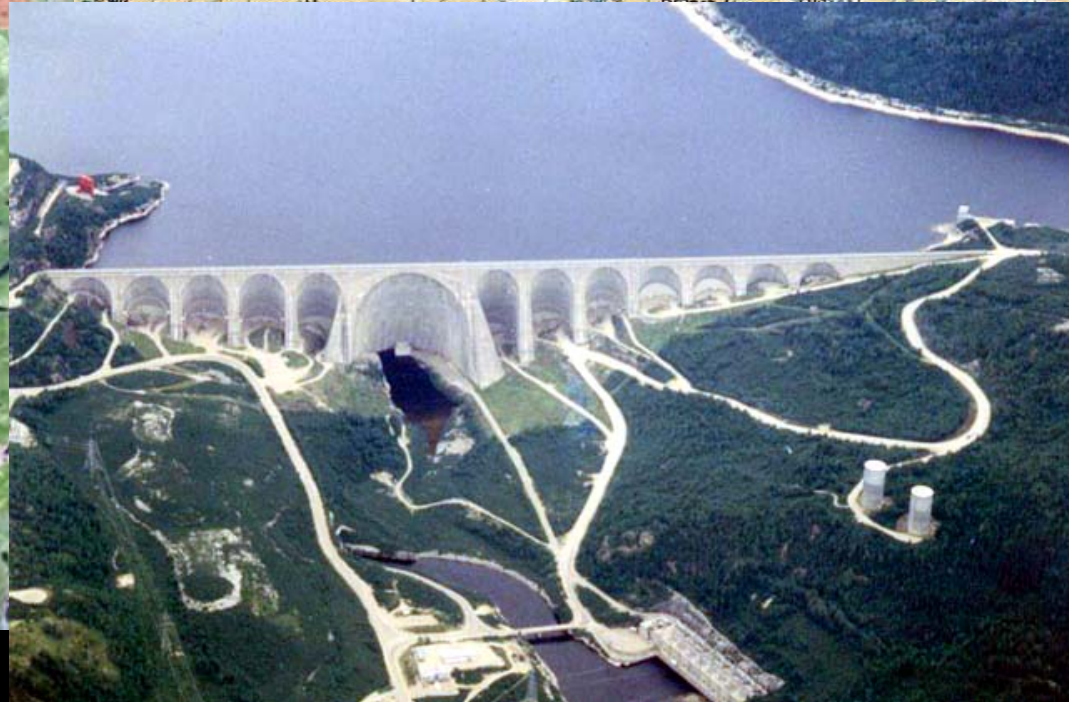
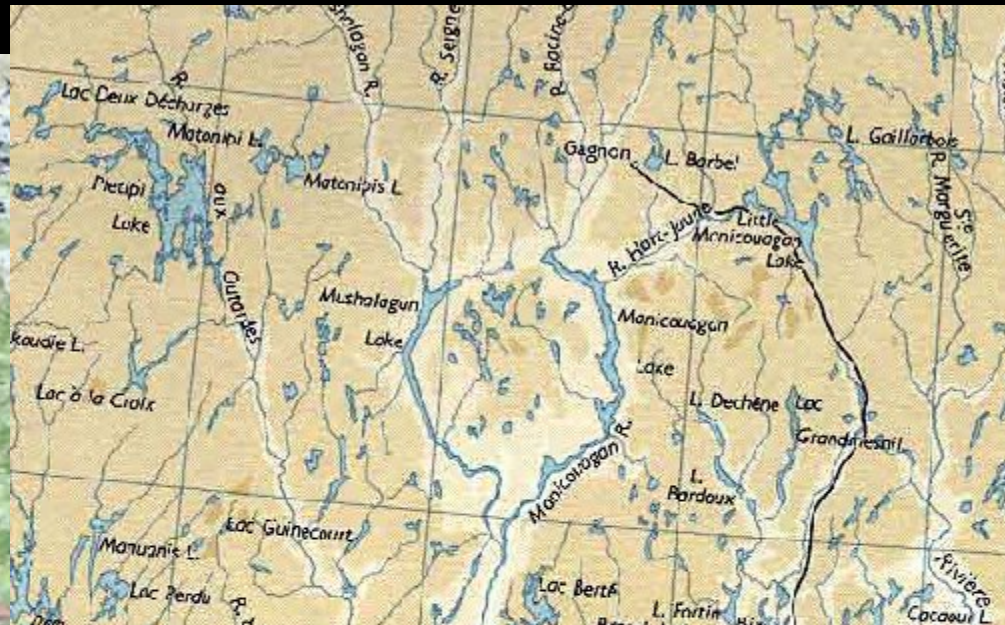
Manicouagan, Quebec – 214 Ma – 100 km.



Manicouagan, Quebec – 214 Ma – 100 km.



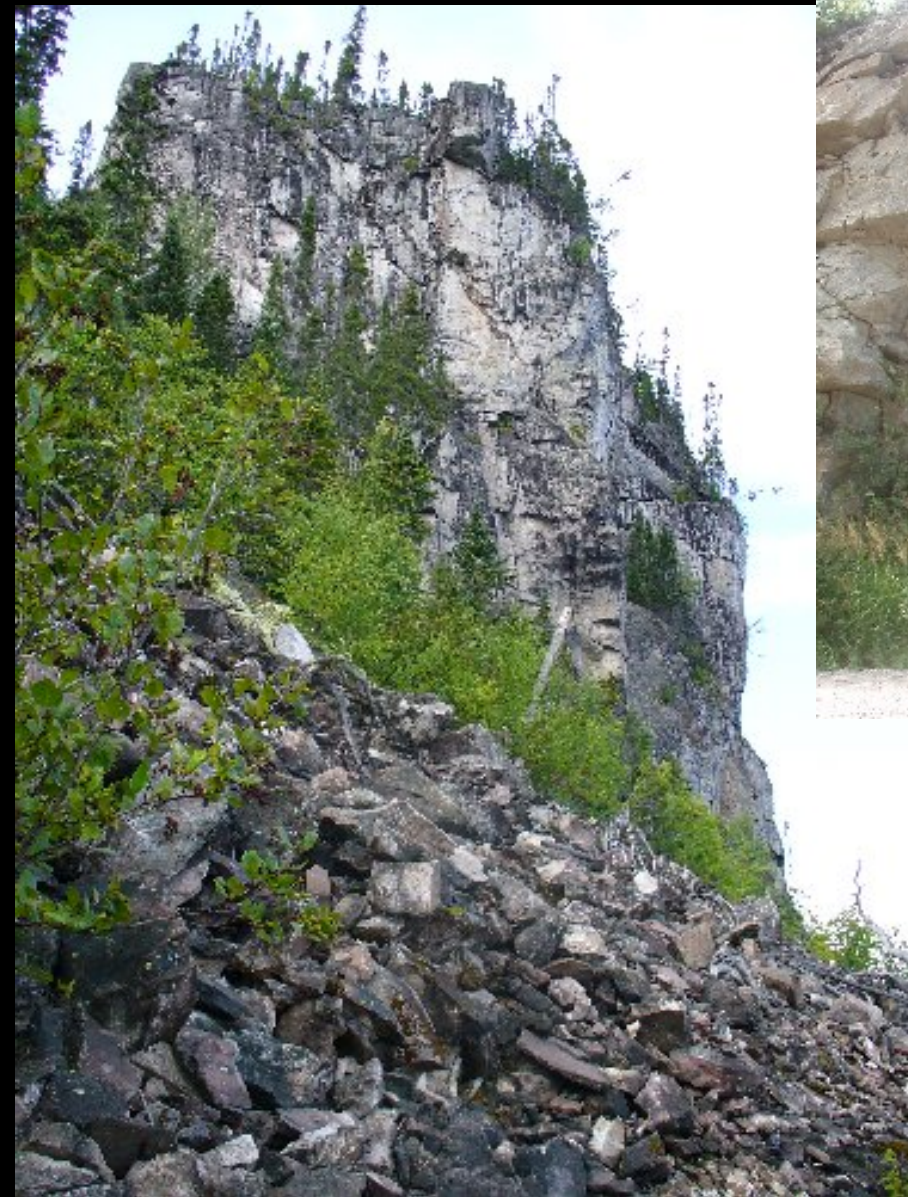
Manicouagan, Quebec – 214 Ma – 100 km.



Manicouagan, Quebec – 214 Ma – 100 km.



Manicouagan, Quebec – 214 Ma – 100 km



Eric and I marooned at Manicouagan



Which of these geologic features are impact craters?
What is definite proof of an impact site????



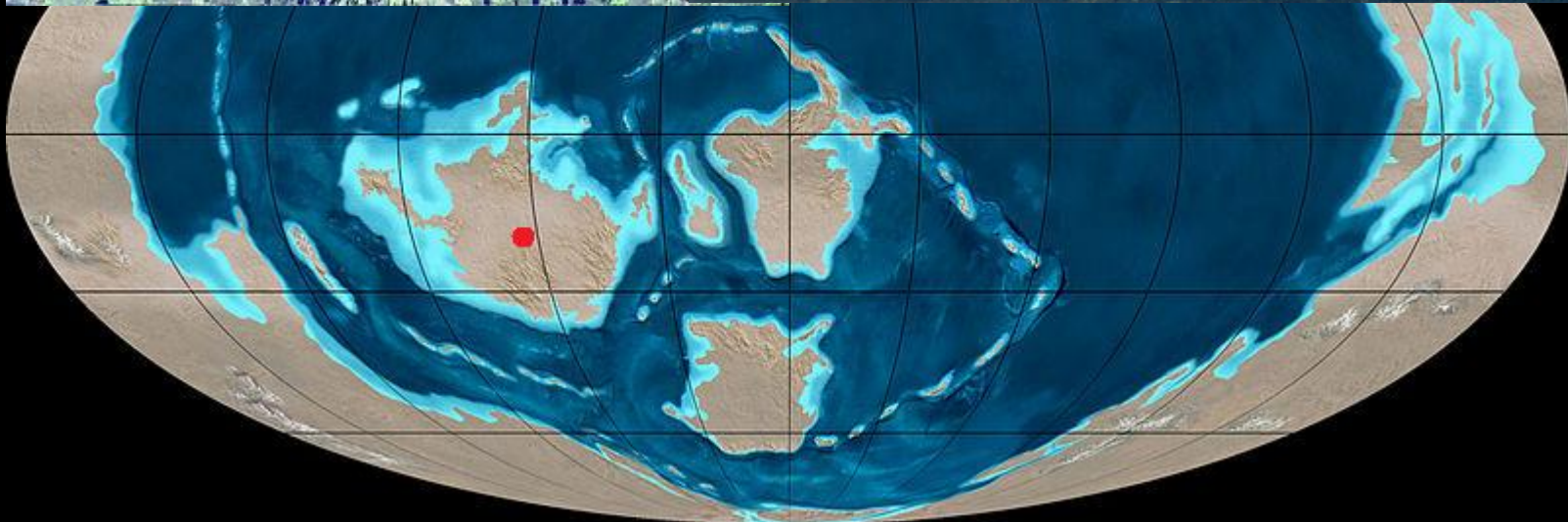
Pres'quile, Quebec - <500 Ma – 24 km.



Pres'quile, Quebec - <500 Ma – 24 km.



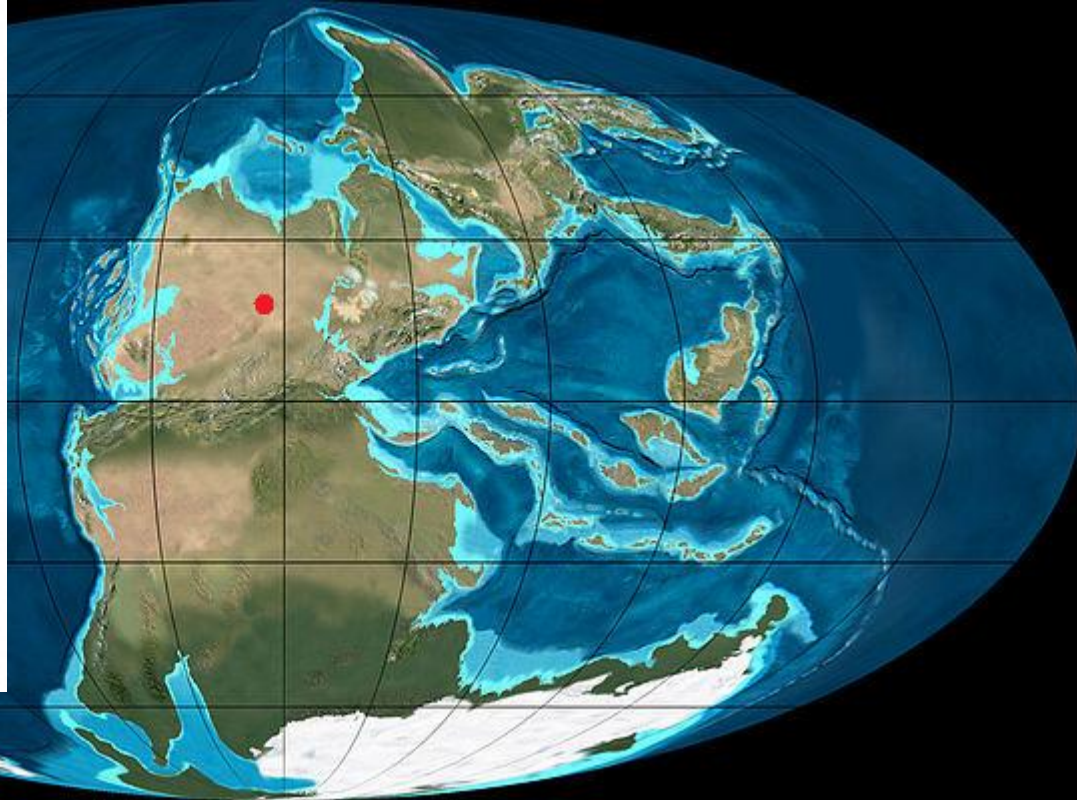
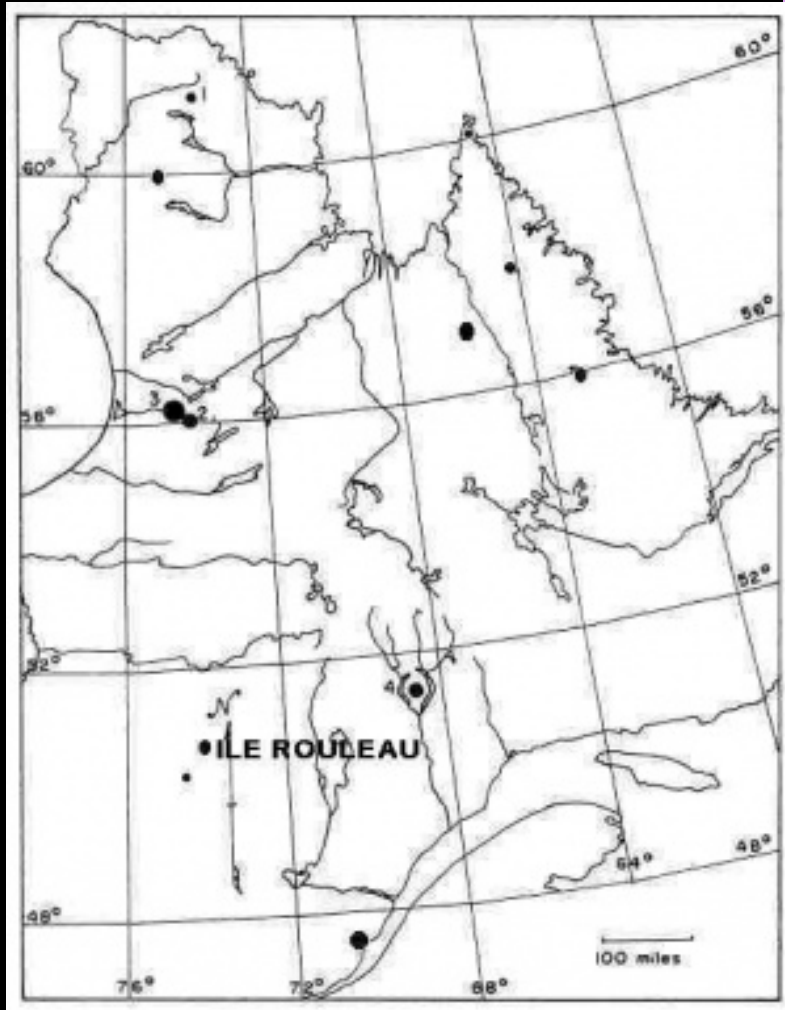
Pres'quile, Quebec - <500 Ma – 24 km.



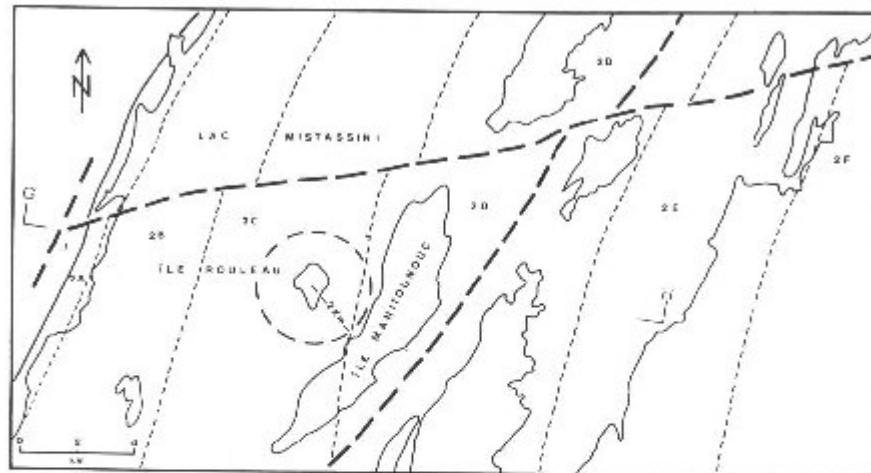
Pres'quile, Quebec - <500 Ma – 24 km.



Ile. Rouleau, Quebec - <300 Ma – 4 km.



Ile. Rouleau, Quebec - <300 Ma – 4 km.



Ile. Rouleau, Quebec - <300 Ma – 4 km.



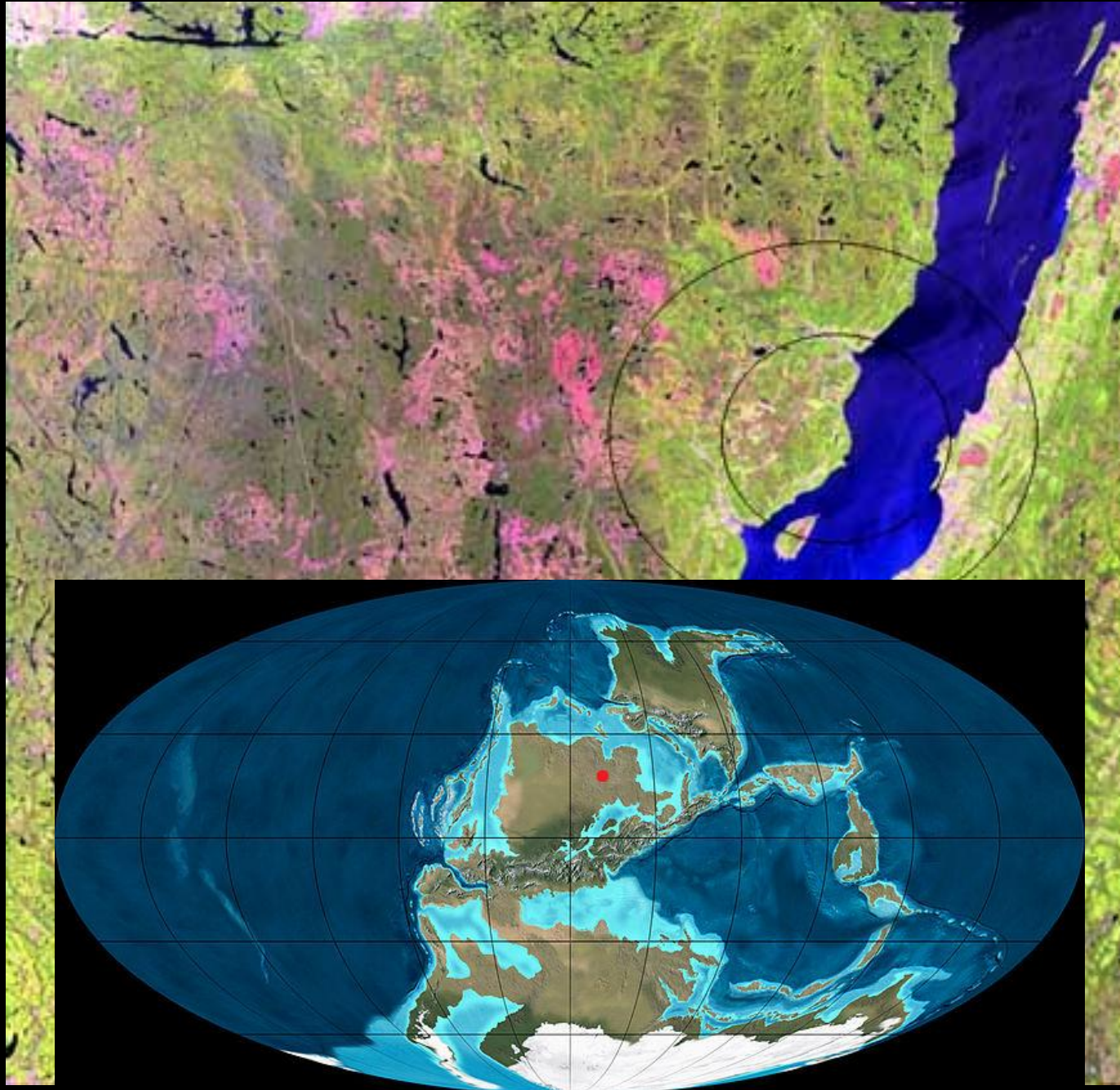
Charlevoix, Quebec – 342 Ma – 54 km.



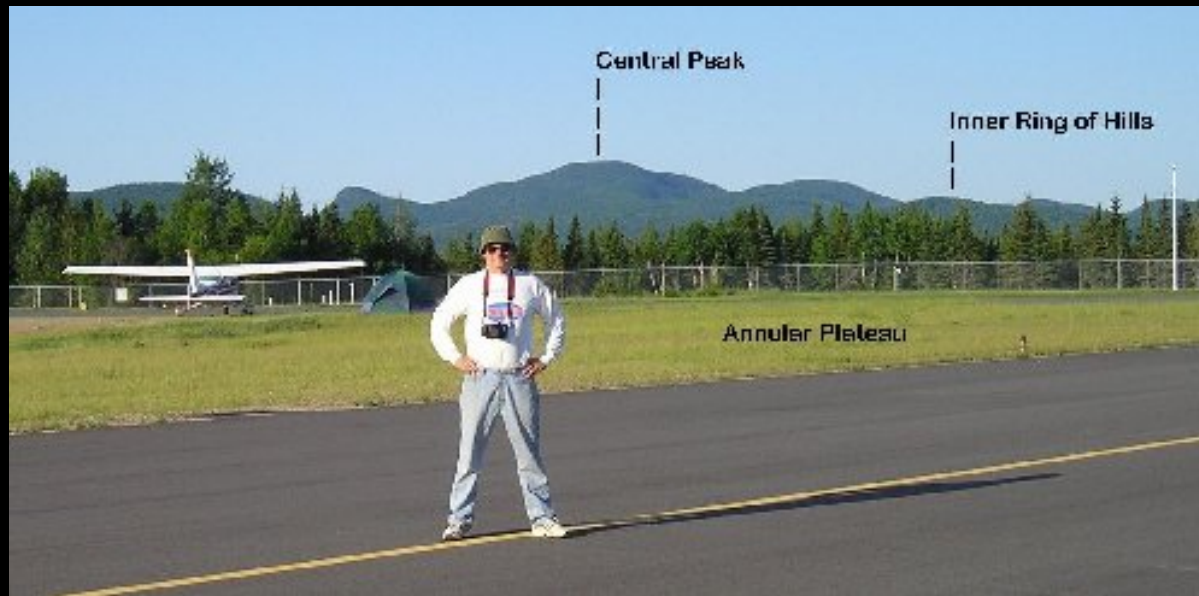
Charlevoix, Quebec – 342 Ma – 54 km.



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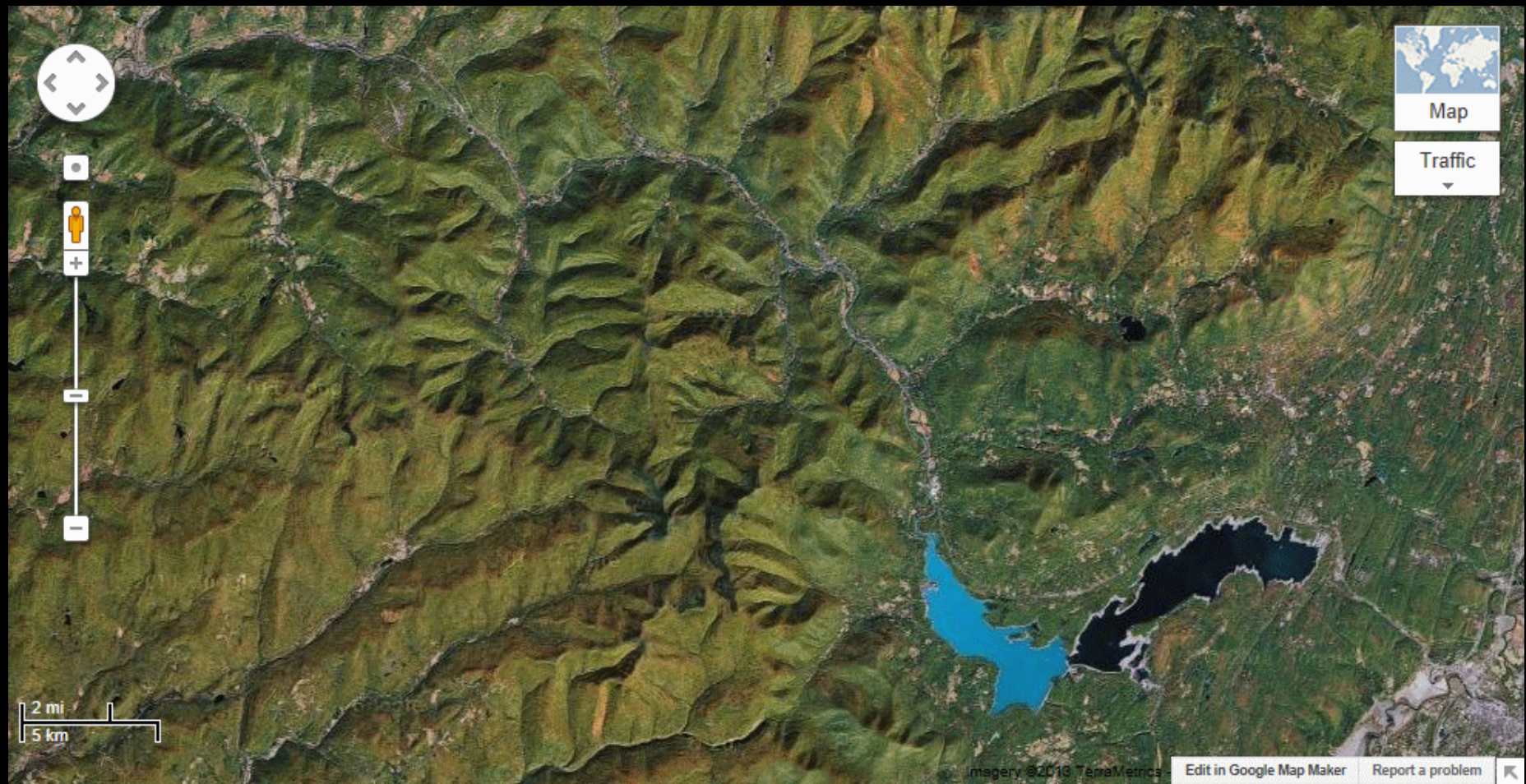
Charlevoix, Quebec – 342 Ma – 54 km.



Charlevoix, Quebec – 342 Ma – 54 km.



PANTHER MOUNTAIN



PANTHER MOUNTAIN



PANTHER MOUNTAIN



PANTHER MOUNTAIN



PANTHER MOUNTAIN "ANALOG" ON MARS



JOKO RIVER, ONTARIO



JOKO RIVER, ONTARIO



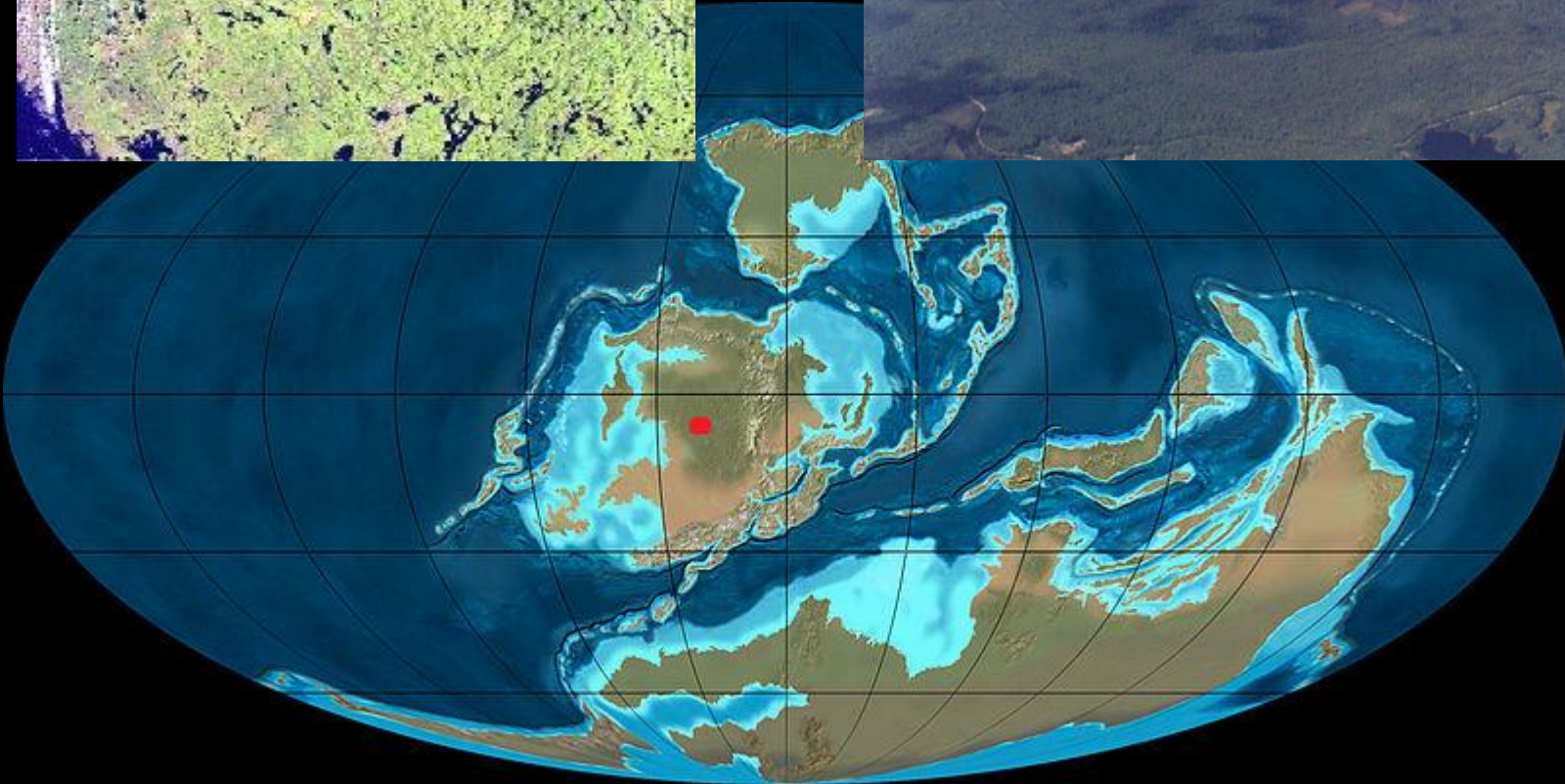
JOKO RIVER, ONTARIO



Which of these geologic features are impact craters?
What is definite proof of an impact site????



Brent, Ontario – 396 Ma – 3.8 km.



BRENT



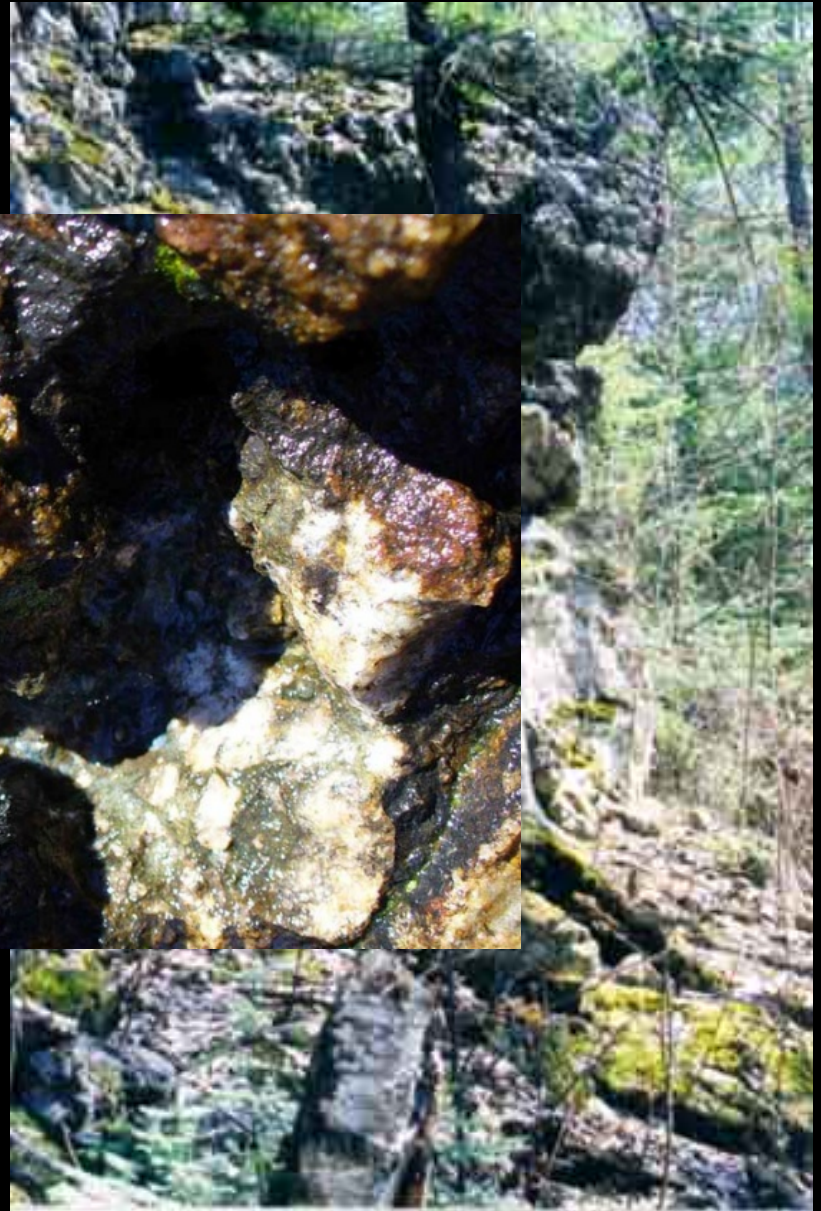
Brent, Ontario – 396 Ma – 3.8 km.



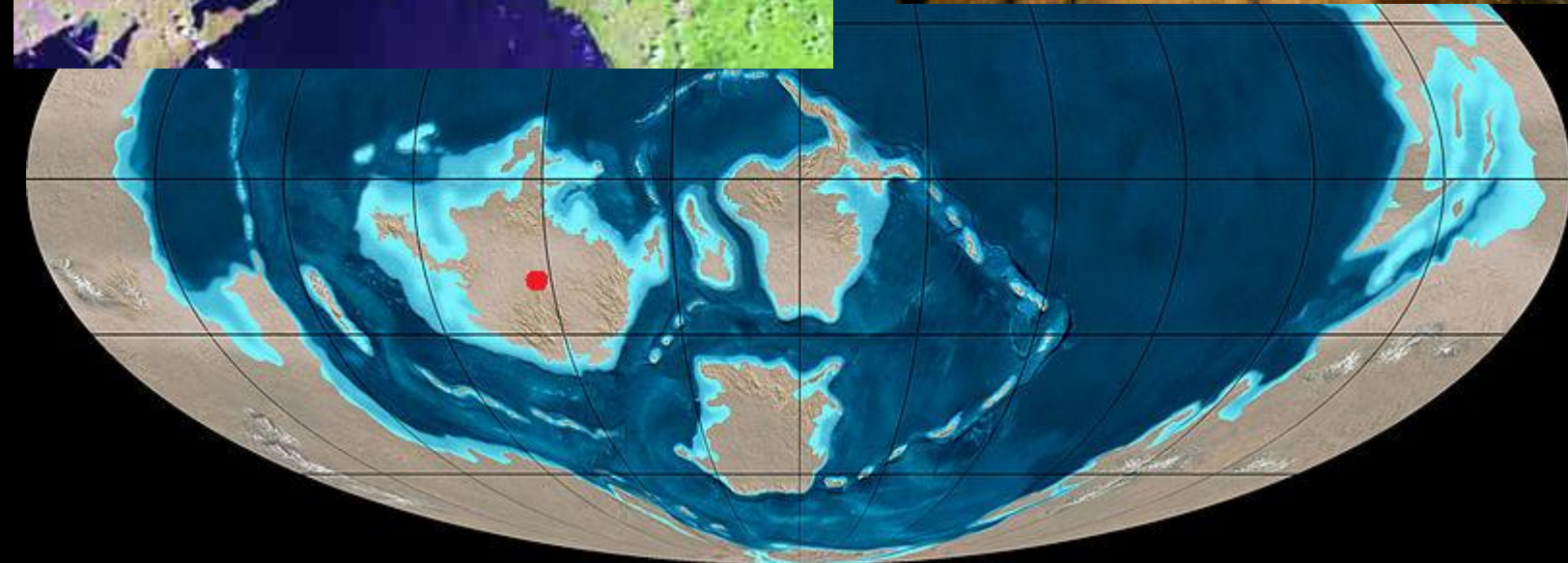
Brent, Ontario – 396 Ma – 3.8 km.



Brent, Ontario – 396 Ma – 3.8 km.



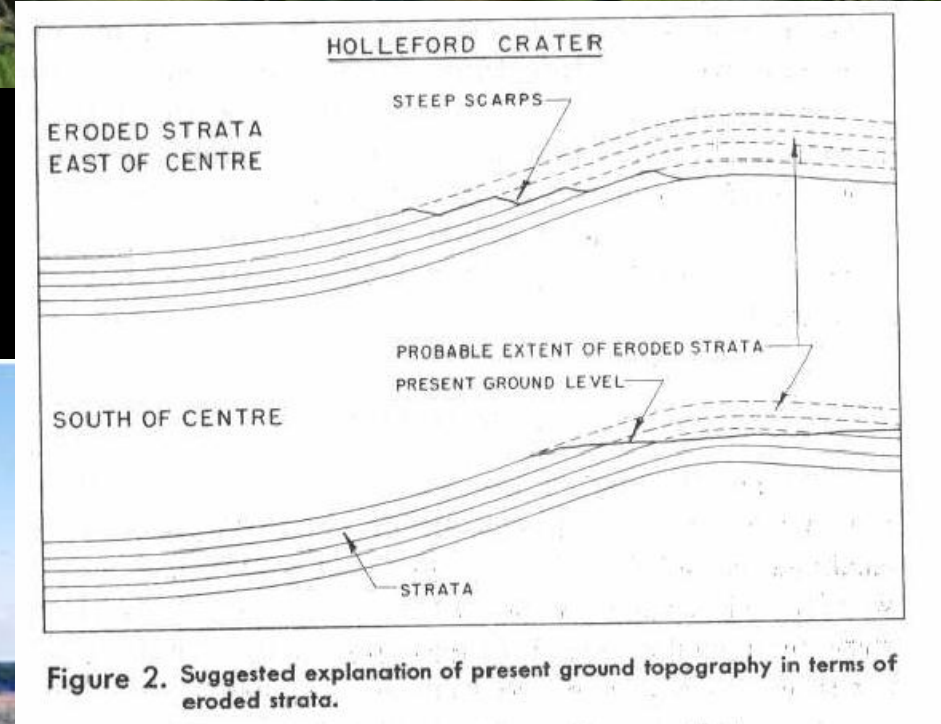
Holleford, Ontario -550 Ma – 2.35 km.



Holleford, Ontario -550 Ma – 2.35 km.



Holleford, Ontario -550 Ma – 2.35 km.



Holleford, Ontario -550 Ma – 2.35 km.

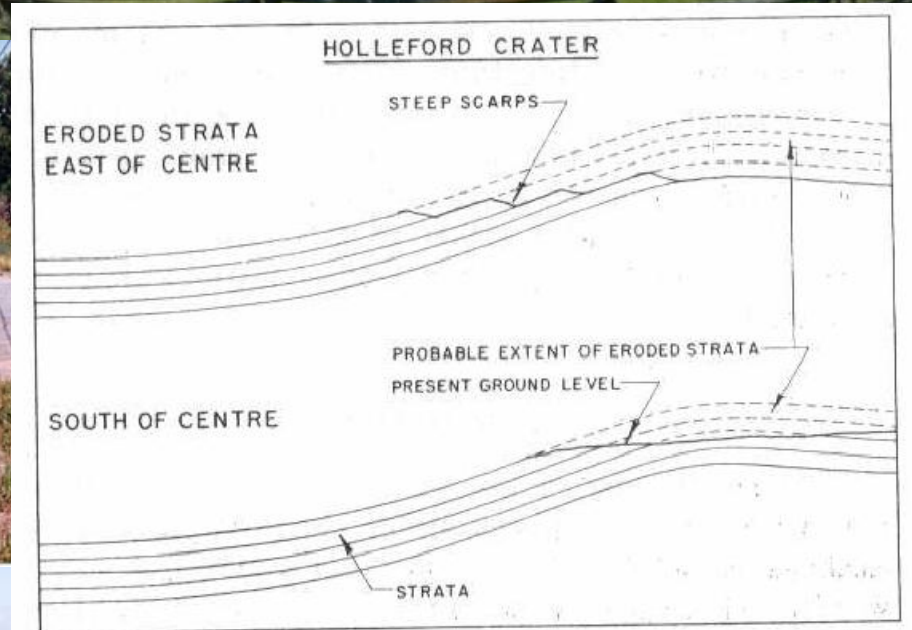
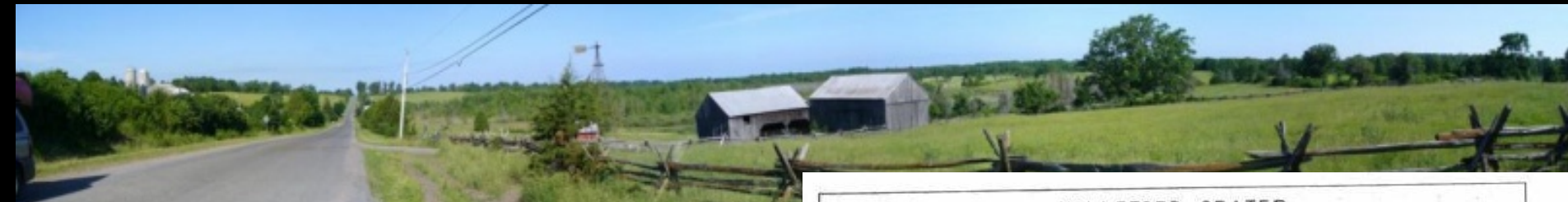


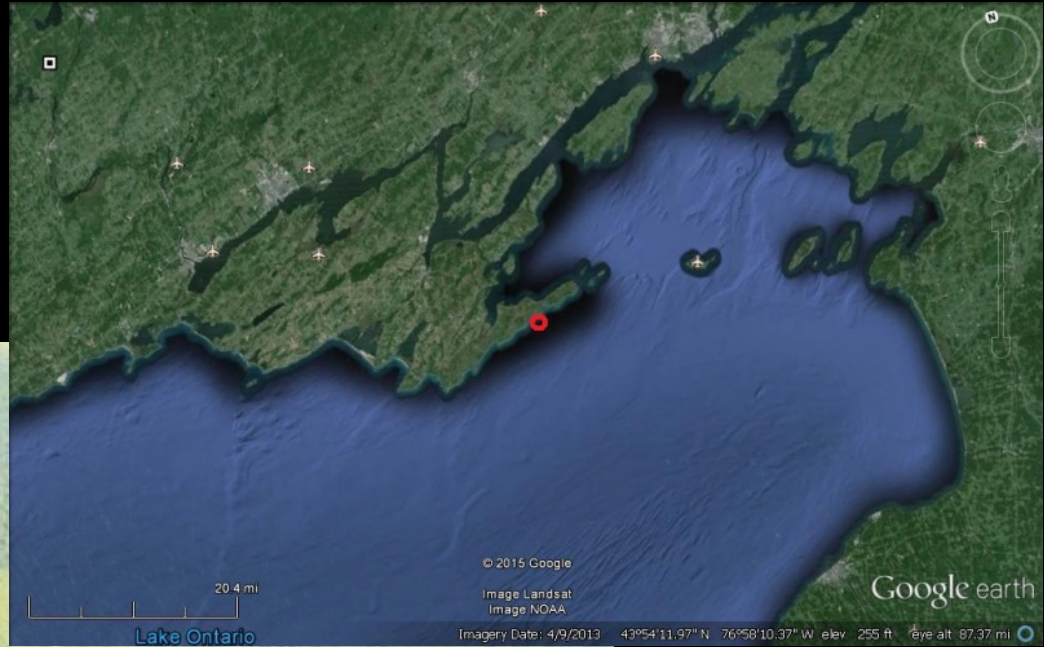
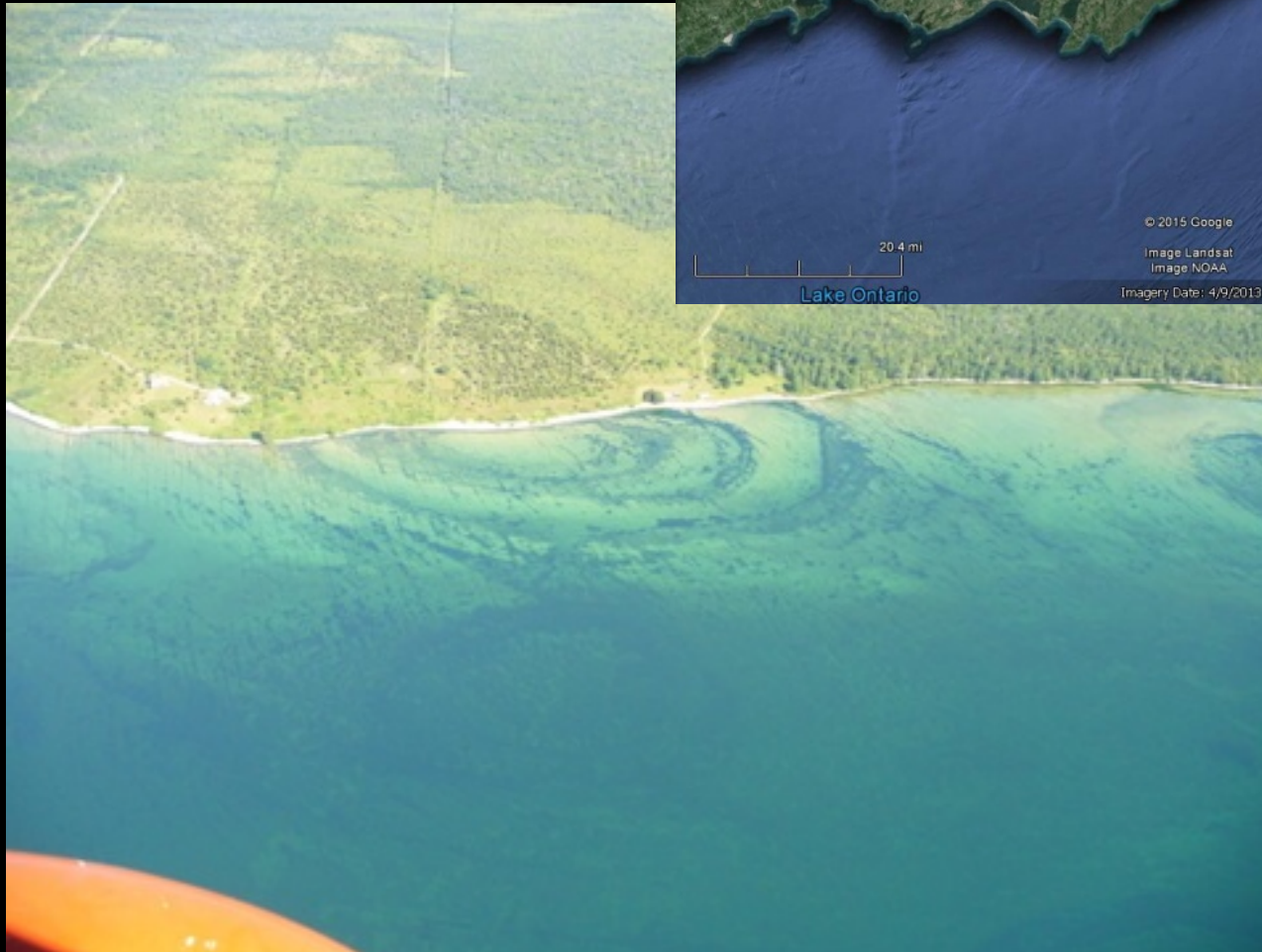
Figure 2. Suggested explanation of present ground topography in terms of eroded strata.



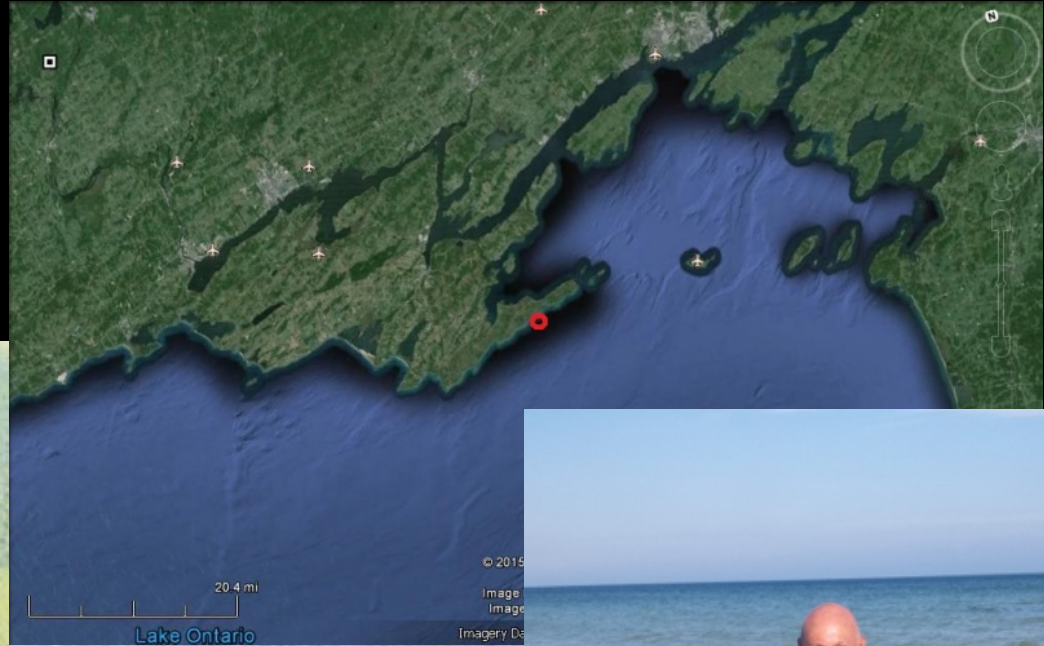
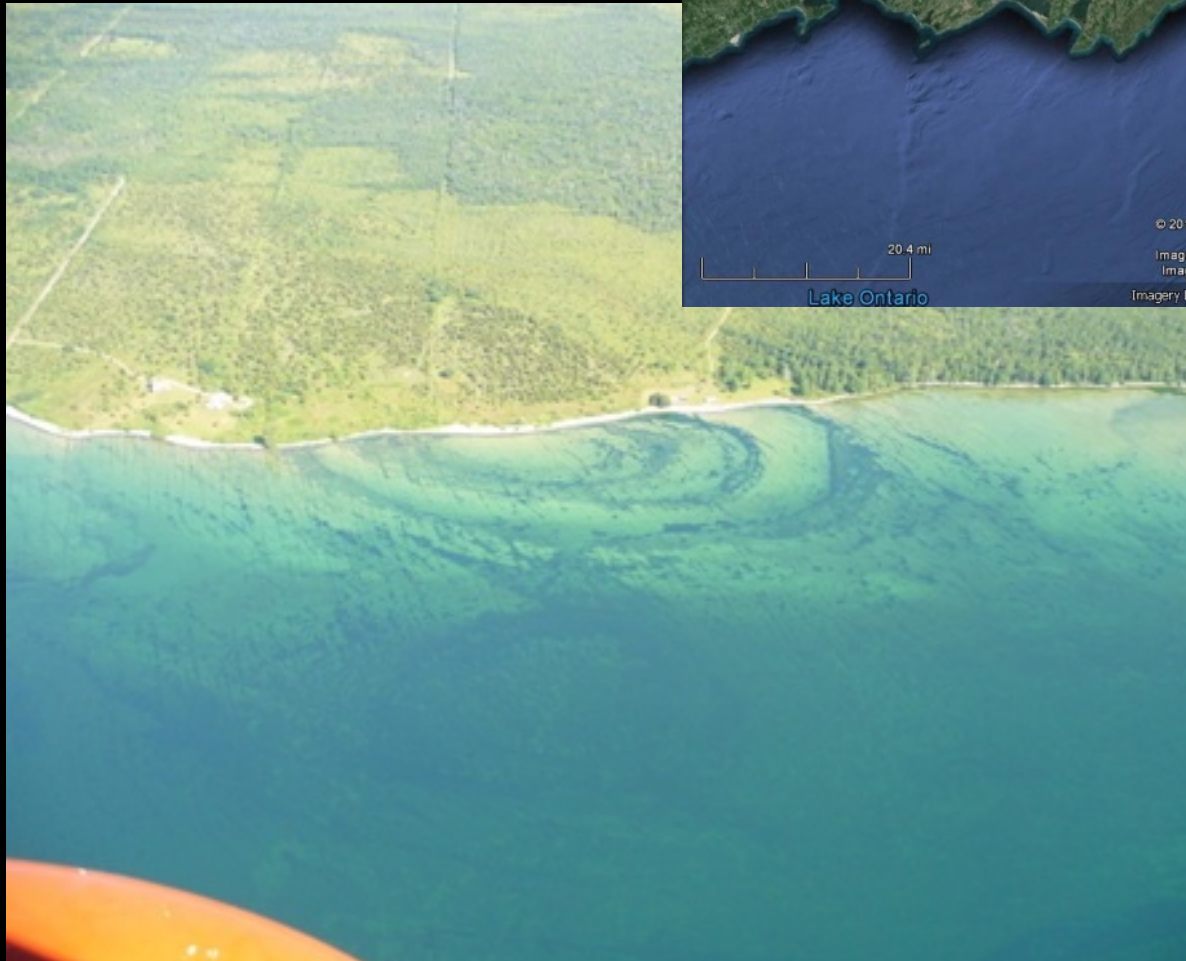
Holleford, Ontario -550 Ma – 2.35 km.



PRINCE EDWARD POINT, ONTARIO



PRINCE EDWARD POINT, ONTARIO



Isaac Asimov – How bright and beautiful a comet is as it
flies past our planet



Isaac Asimov – How bright and beautiful a comet is as it flies past our planet



... provided it does fly *PAST* it.